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SEE PAGE 86



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The 1937 Delta line incorporates many new tools, new improvements, new accessories—of interest to every man who works with tools. The complete Delta line includes Drill Presses, Circular, Band, Scroll Saws, Lathes, Shapers, Sanders, Grinders and full line of accessories.

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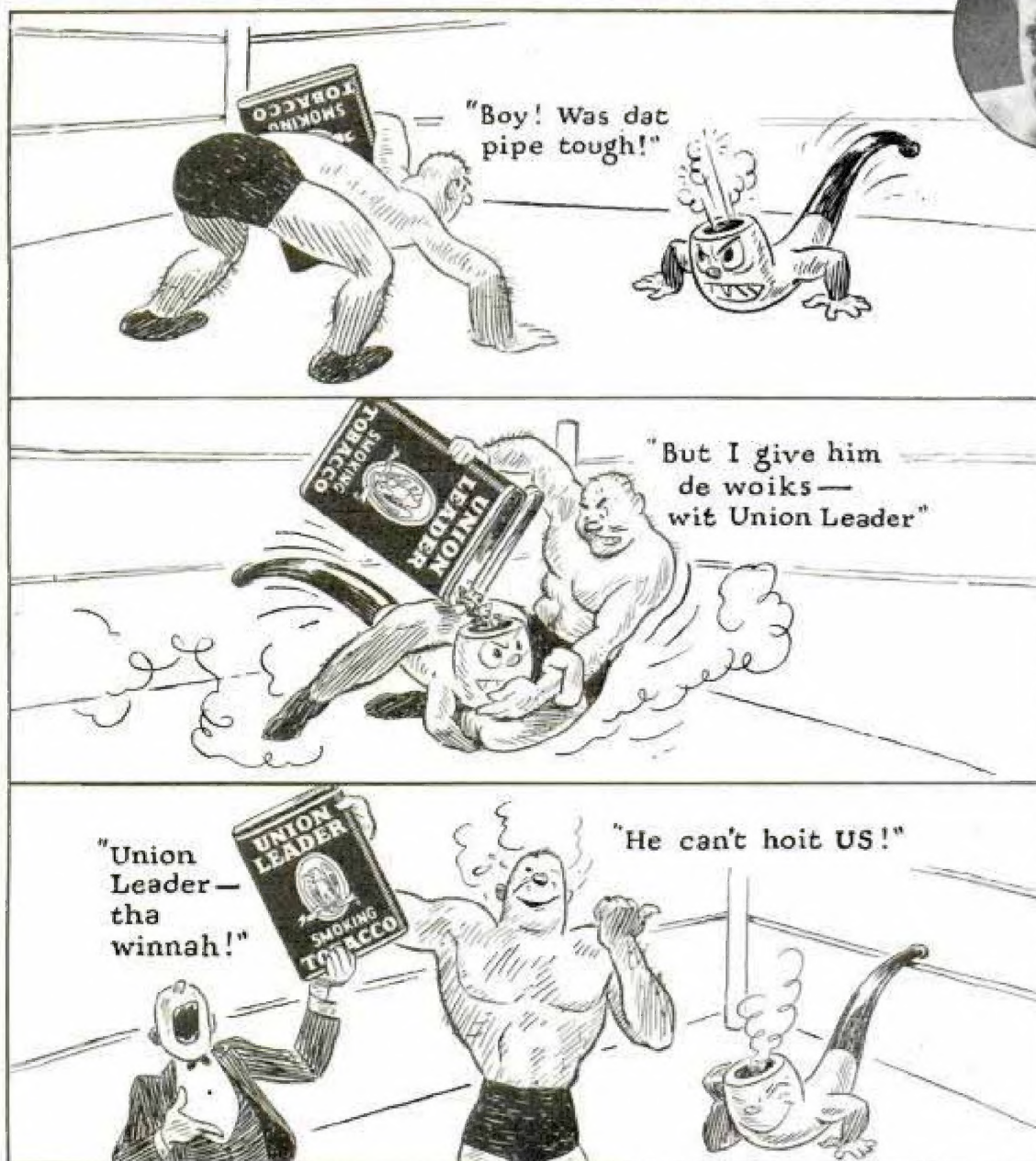
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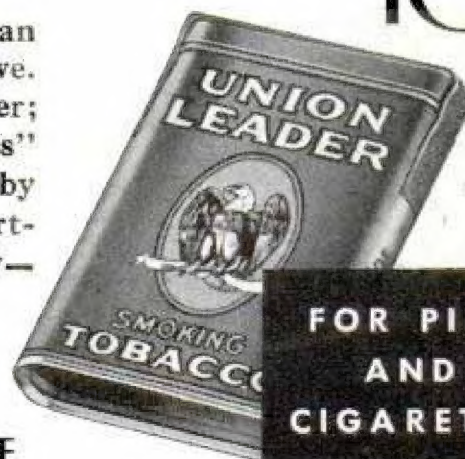
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Popular Mechanics Magazine

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January, 1937

Vol. 67, No. 1

Special Features

Easier Motoring for 1937	1
Hitch Your Wagon to a Car	Coloroto
Asleep in the Clouds	18
Breaking Speed Records on Salt	26
Engineer Casey Jones Turns Motorman	34
Giant Bombers Guard Nation's Gates	42
The Home That Runs Itself—Part I	50
Trouble Shooter for a Railroad	58
The Flying Penman	66
Cutting Capers on Ice	74
Docking the Big Fellows	82
Motoring on Skis	86
Gold Farmers of the West	90

(Continued on next page)

Around the World by Air

EVER since Columbus proved the earth is round, circumnavigation of the globe has been a challenge and a goal for adventurous man. Magellan's little flagship did it first and it took three years. Since then, with a steadily increasing tempo through the centuries, globe-girdlers have been whittling down the time. Wiley Post and Harold Gatty made a breathless dash around the top of the globe in less than nine days. Today, anyone with \$3,000 can fly around the world, covering more than 24,000 miles in three weeks or less, and traveling on regular, scheduled commercial aircraft. Watch in the February issue for the first of two articles describing an air trip around the world. You'll find it illustrated with eight pages of Coloroto pictures.

Next Month

SQUEEZE into the tiny cockpit of a racing plane beside the pilot and you'll get enough thrills in a few minutes to last you the rest of your life. A race around a closed course is a terrifying nightmare to anyone except a trained "pylon polisher." An article in the February issue takes you for a ride by proxy in the cockpit of a racer.

Pirates Still Live

PIRATES today? Sure there are. When the eerie mists creep over the New York waterfront, pirates set forth to plunder the world's richest harbor. And, more often than not, they would succeed were it not for the harbor police who wage unremitting warfare against these modern freebooters. Watch for the article, "Harbor Pirates on the Run," next month.

Afraid of the Dark?

ARE you afraid of the dark? You should be, if you drive a car because darkness is the ally of death on our highways. More than three-fourths of our automobile traffic is by day, yet more than half the fatal accidents occur at night. Now science has found a way to prevent about half these night fatalities, and at comparatively low cost. Read how it can be done next month in "Conquering Death after Dark."

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(Contents—Continued)

AUTOMOTIVE

Streamlined hood on motorcycle boosts speed.....	17
Windshield defroster fan with rubber blades.....	24
Tire chain for dual-wheel trucks.....	41
Car atop building latest in advertising.....	46
Speeding up metal hardening.....	48
Auto driven by centrifugal ejection of air.....	56
Car with rudderlike tail.....	71
Automobile driven by hands alone.....	73
Small racer goes ninety miles an hour.....	78
Alaska street car built of odd parts.....	88
Bus carries baby's buggy on hooks at rear.....	95
Three-wheel teardrop car has rear engine.....	95

AVIATION

Radio signal replaces bomb in target practice.....	48
Record set for plane for high flying.....	55
"Flying boxcar" hauls freight on fast schedule.....	63
Laboratory plane tests flight above weather.....	65
Sleeper flying boats carry sixty passengers.....	70
"Flying laboratory" to do six miles a minute.....	72
De-icers protect air liners in winter.....	85
Plane takes off from railway handcar.....	88

CONSTRUCTION

Cafe walls move to vary seating capacity.....	24
Leaning towers of Boulder dam.....	39
Burning off paint speeded by flame spreader.....	46
Asphalt roads reinforced with cotton.....	47
Spheroid gasoline tank holds 100,000 barrels.....	72
Acidproof cement bricks resist weather.....	81

FARMS AND GARDENS

Orange-lemon, giant mango among late fruits.....	30
Lactic acid made from whey.....	71
"Delicious monster" latest fruit from tropics.....	80
Generator on wheels works for farmer.....	89
Persian lambs to be raised on American farms.....	96

HOUSEHOLD

Automatic stoker also empties ashes.....	17
Aluminum salt-pepper shakers marked "S" or "P".....	32
Gutters cleared of ice by chemical "brick".....	33
Measuring dial on coffee jar.....	41
Portable gas lighter kindles furnace fire.....	46
All-glass table for home.....	48
Locked drain lid on utensil.....	63
Vacuum pump for canning prevents food spoilage.....	94

MOVIES AND PHOTOGRAPHY

Spanish galleon built for motion picture.....	47
Lifelike color for movie forecast.....	80
Pigeons speed film to city papers.....	81
Film sorting case for amateur movies.....	96

RADIO AND ELECTRICITY

Hurricane-hunting radio hangs from balloon by aerial.....	31
Inter-office phone uses light circuit.....	47
Light beam changed into musical chords.....	57
Electric eyes count vehicles but ignore pedestrians.....	64
Million-volt generator for X-ray tube.....	79
Human tissue photographed by radio.....	81
Shower bath in electric sparks.....	94
Goggles for short-wave treatments.....	96
Television system of advanced design.....	97
Six-tube a.c.-d.c. super for long and short waves.....	98
How to build a five-meter pocket receiver.....	100
Practical radio suggestions.....	101
Battery converter operates a.c. receiver in car.....	102
Crystal holder controlled from panel.....	102
Radio desk set has inkwell and clock.....	102

SCIENCE AND INDUSTRY

Japanese discards theory that heart pumps blood.....	17
Workers chip ribs of giant mirror.....	33
Rat's leg transplanted to another rat.....	41
South land of opportunity for the chemist.....	46
Rotating frame for 200-inch "eye".....	57
Powerful gun's bullets tap new oil pockets.....	62
Age of invention still in infancy.....	63
Gas passes through hot metal.....	78
Lost city soon to vanish again.....	95

SPORTS

Red golf balls for Arctic ocean course.....	17
Safety swing for playground.....	23

(Continued to page 6A)

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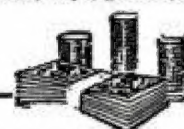
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(Contents—Continued)

Overnight tent pitched on top of auto	40
"Water ball" played with fire hoses	47
Tent in stands for rainy-day game	56
Electric scoreboard flashes race results	70
Spring frame on bike gives softer ride	73

MISCELLANEOUS

Masked rescuers sweep city after gas raid	23
Metal "traffic cop" guards school zone	24
Electric log shows "Queen Mary's" speed	25
Telegrams by facsimile latest wire service	30
Air rudder helps steer 150-mile speedboat	31
Ice thinner in sub-zero temperature	32
Metal sled built like plane	32
Twin Diesels drive submarine in tests	32
Plywood figure directs tourists to camp	33
Marine amphitheater to feature 1939 world's fair	38
Billion-gallon water siphon	39
Steam turbine locomotive powered like ocean liner	39
Craftsmen of old on modern liner	40
Self-sustaining refuge for wartime gas attack	40
Latest Australian locomotive streamlined for speed	49
Lathe cuts grooves with spindle gripper	49
Mississippi river modeled in coal	49
Warships fire at radio-controlled planes	56
Fireworks etching of King Edward for coronation	64
Uses for wood increasing	64
Streamline trailer for bike has radio	70
Sailors cling to rigging as ship sinks	71
Model shows moon phases as spotlight moves	73
Racket restrainer keeps tension uniform	79
Dentist's office in trailer serves needy	80
Wooden horses join museum of relics	89
Noiseless furniture leg tip saves floor wear	94

Craftsman and Shop Notes

AUTOMOTIVE

Bench depressing tool removes valve springs	158
Bumper step simplifies removing luggage	158
Keeping chamois skin damp for cleaning	158
Repairing stripped threads in a crankcase	158
Detachable armrest for driver	159
Running board shoe scraper for truck cab	159
"Saw-tooth" loading platform handles many trucks	159
Snow short circuits spark plugs	159

ART AND DRAFTING

Complete drawing kit	103
Holder for artist's brush	126
Plans on drafting table rack	140
Rack on drafting table for plans	140
Hairs tightened in cheap art brushes	144
Sign writer holds cloth taut for signs	149

FARM

Adjustable holder keeps mouth of sack taut	105
Gas bailed from wells	105
Utility buckets from 5-gal. oil cans	160

FURNITURE

Pembroke table by Hepplewhite	108
Two attractive wastebaskets	111
Bedroom suite built with hand tools	120
Child's closet of plywood	127

HAND TOOLS

Tool molds filler between wallboard joints	104
Small drills carried in spectacle case	106
Improving a calking tool	106
Workman's chest cushioned against bit brace	106
Calibrated punch measures holes	107
Miter box has clamp for small work	107
Wrecking bar to remove old flooring	110
Bench hardy from cold chisel	112
Boring tool to lay pipe under sidewalks	112
Flue cleaner shaves off corrosion	112
Self-centering marking punch for screw holes	112
Holder for small tools fits inside toolbox	126
Pressure gun for filling cracks with plastics	128
Gauge spaces siding boards equally	135
Wire winder for forming springs	136
Adjustable vise handle speeds jobs	137

(Continued to page 8A)

Are you, too, up against life's big question— "How Can I Make More Money?"

Every bill to be paid, every need to be met, every dream still unfulfilled—demands the answer to this question. For on its answer hang all the other answers of life: how you live, what you wear, where you go, what you do, the position you hold, the one you hope to hold in future!...

MORE than anywhere else, this question haunts you daily on the job. You want a bigger salary; more pleasant and interesting work to do; more advantages for your loved ones—recreation, travel, social activities. And so, as you keep plodding on, in between the little thoughts comes this big one, again and again: "How can I make more money?"

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Out of the corner of your eye you can see a long line of folks just waiting for the job you have now. Any time you're "out," a dozen others are ready to step in. So it's dangerous to resign and look elsewhere, isn't it? Besides, jobs in your same line elsewhere are bound to pay about what you're earning now.

What's Wrong, Anyway?

Let's be quite serious for a moment about this "money" question. Who, as you glance around the business world, are the money-makers in it? Are they the filing clerks, typists, stenographers, bookkeepers, timekeepers and routine clerical people? Or are they the expert salesmen, the accountants and C. P. A.'s, the attorneys, the traffic managers, the personnel directors, the sales correspondents, the sales managers, and other executives who give orders for other people to execute?

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(Contents—Continued)

Angle-handle knife cuts without wrist strain.....	137
Soldering-iron handle kept cool by turnbuckle.....	149
Handle to use short solder bars	131A

HOME IMPROVEMENTS

Storm sash with double vents provide ventilation...	118
Picture lighting by footlight reflectors	135
Shingle siding improved with furring strips.....	136

HOUSEHOLD

Leaky radiator valve kept from marring walls.....	106
Bed lamp gives direct and indirect light	113
Hanging plate-glass mirrors	116
Tin lugs keep pot cover from slipping	116
Shield under knife sharpener to protect wall.....	126
Shopping list kept on shopping bag	126
Furnace poker serves as clinker hook	137
Simple methods of solving home problems.....	138
Coil spring supports funnel	140
Spiral drain cleaner with ball tip ends	145

OFFICE

Stencil cut in typewriter without wrinkling	106
Typewriter platen has ruled lines	119
Typewriter ruler saves time for stenographer.....	150

PHOTOGRAPHY

Developing tray improved with small drain holes...	107
Table on exposure meter avoids ruined photos.....	128
Tripod head swings camera to vertical position.....	129

PLUMBING

Damp oakum used for leading pipe joints	110
Flushing clogged soil pipes	128
Check valves improvised from pipe fittings.....	144

POWER TOOLS

Chips kept out of lathe shaft	136
Drive your hack saw electrically	141
Emery-belt polisher saves hand work	151
Auto motor runs arc welder	152

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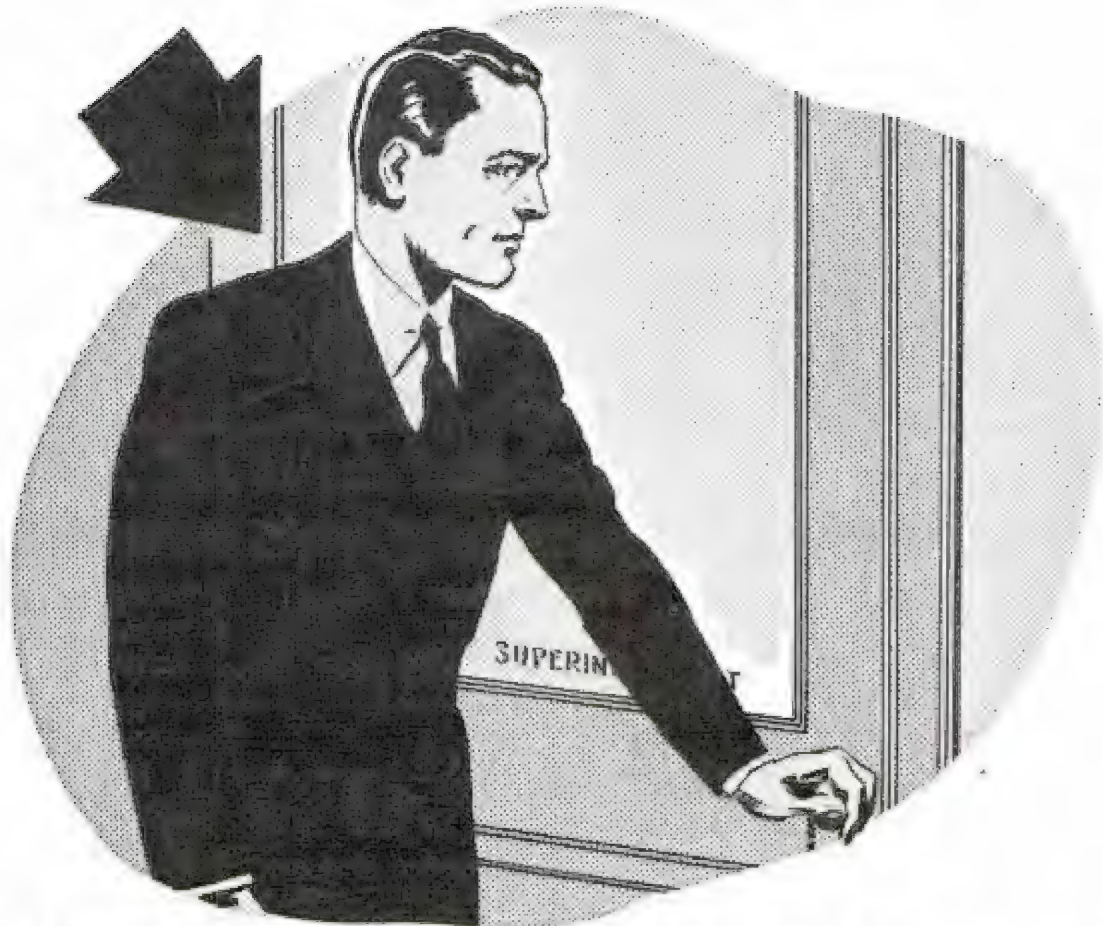
Sweeping compound from sawdust	104
Signs painted on wire with aid of board	118
Window display operated from street	144
Flashing window sign has no moving parts	145
Finger grips for handling blueprints	149
Welder's eye shield hinged to wall	160

WOODWORKING

Bench stop made from half of hinge	113
Doll house built of plywood	114
Glue pot from oil can	116
Fasteners for rubber-band clamps	118
Workshop operations on a shaper	146

MISCELLANEOUS

Glassware etched with a stencil	105
Wheel chair has mudguards	107
Eyes for animal cutouts	110
Safety beacons for ice skaters	110
Cleaning buckskin shoes	113
Disk scraper cleans sidewalks	116
Emergency microscope-slide mounting	116
Table-top Christmas trees	117
Cutting patterns from thin cloth	118
"Cage" holds ball of knitting yarn	119
Simple thermostat from pipe fittings	126
Handy pocket oilers from shells	128
Winter hot-dog stand like Arctic igloo	129
Gas-driven plane is speedy flyer	130
Disconnecting copper tubing	136
Drop oiler from can and tire valve	136
Flexible-brush combination cleans curved surfaces...	137
Brick cleaner from spring leaf	143
Handy roller for material yard	144
Loose lock held by turnbutton	148
Sand hoisted in canvas bags	149
Putty kept warm with heated brick	150
Trackwalker's grease bucket supported on legs...	150
Watches wound on rubber strip on desk edge.....	150
Combination ear muffs and sun glasses	151
An improvised glue pot	119A
Hillside trees protected by rock walls	134A
Belt dressing from rubber	146A



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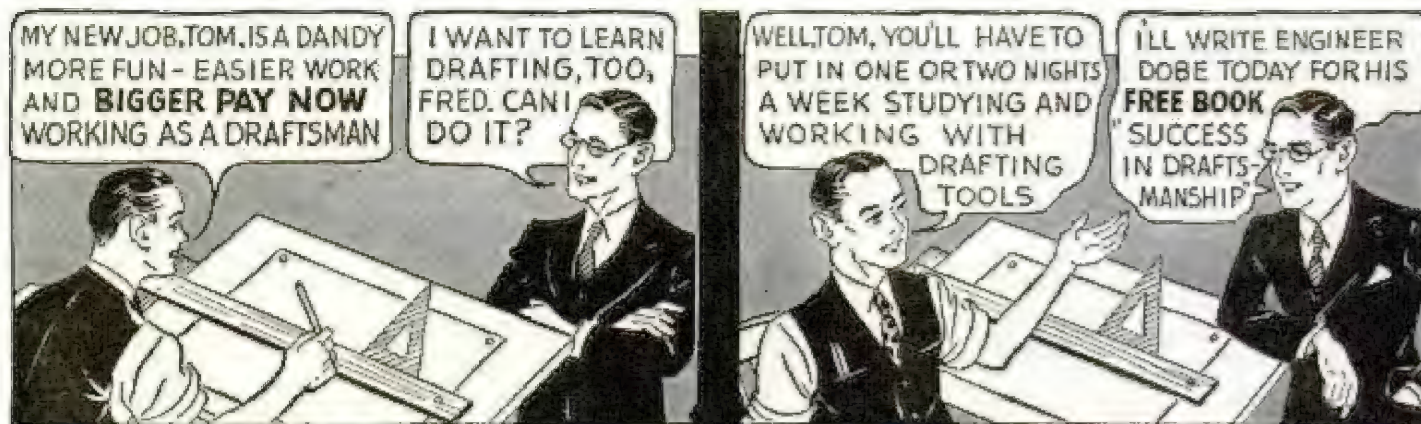
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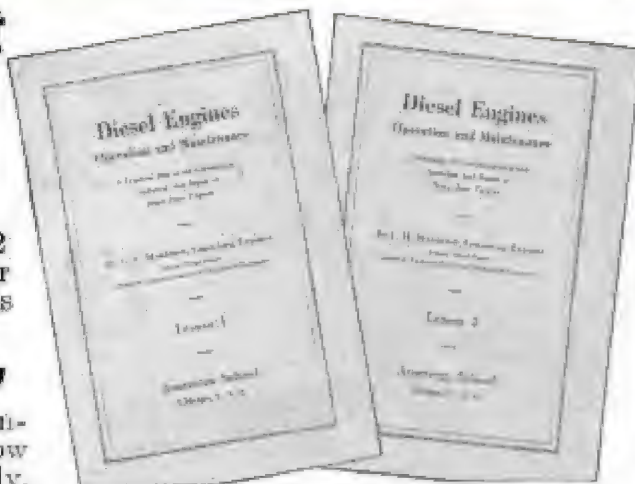
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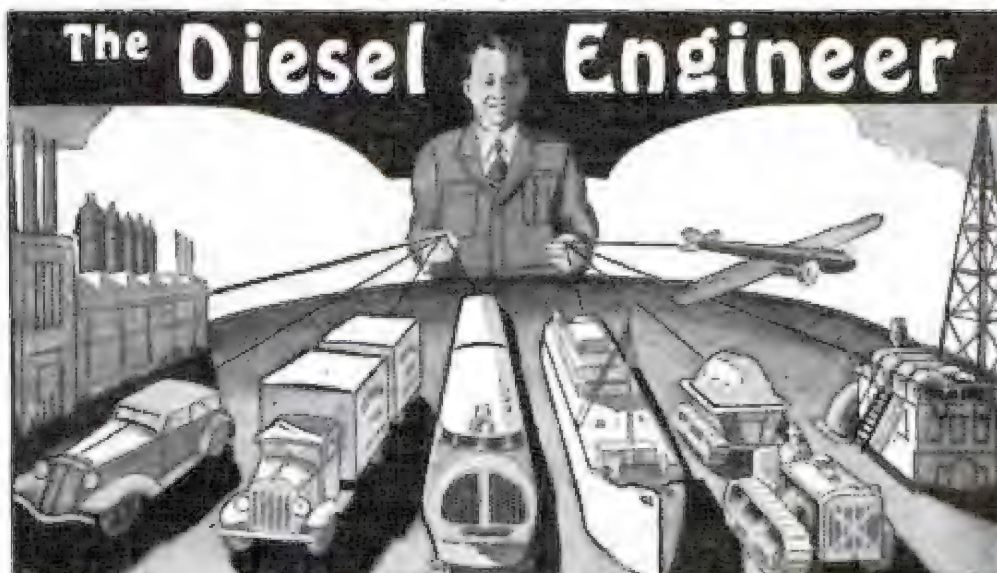
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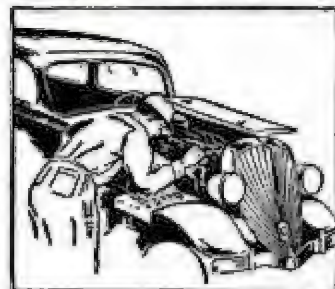
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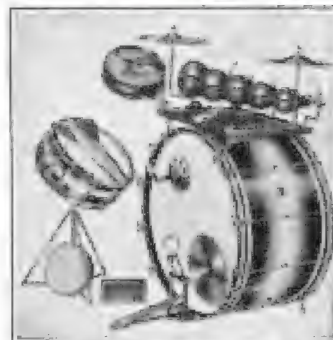
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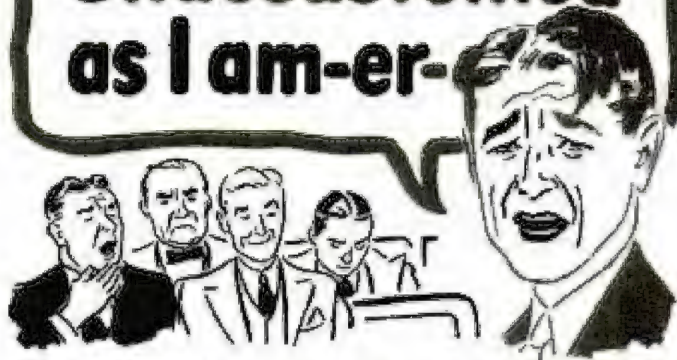
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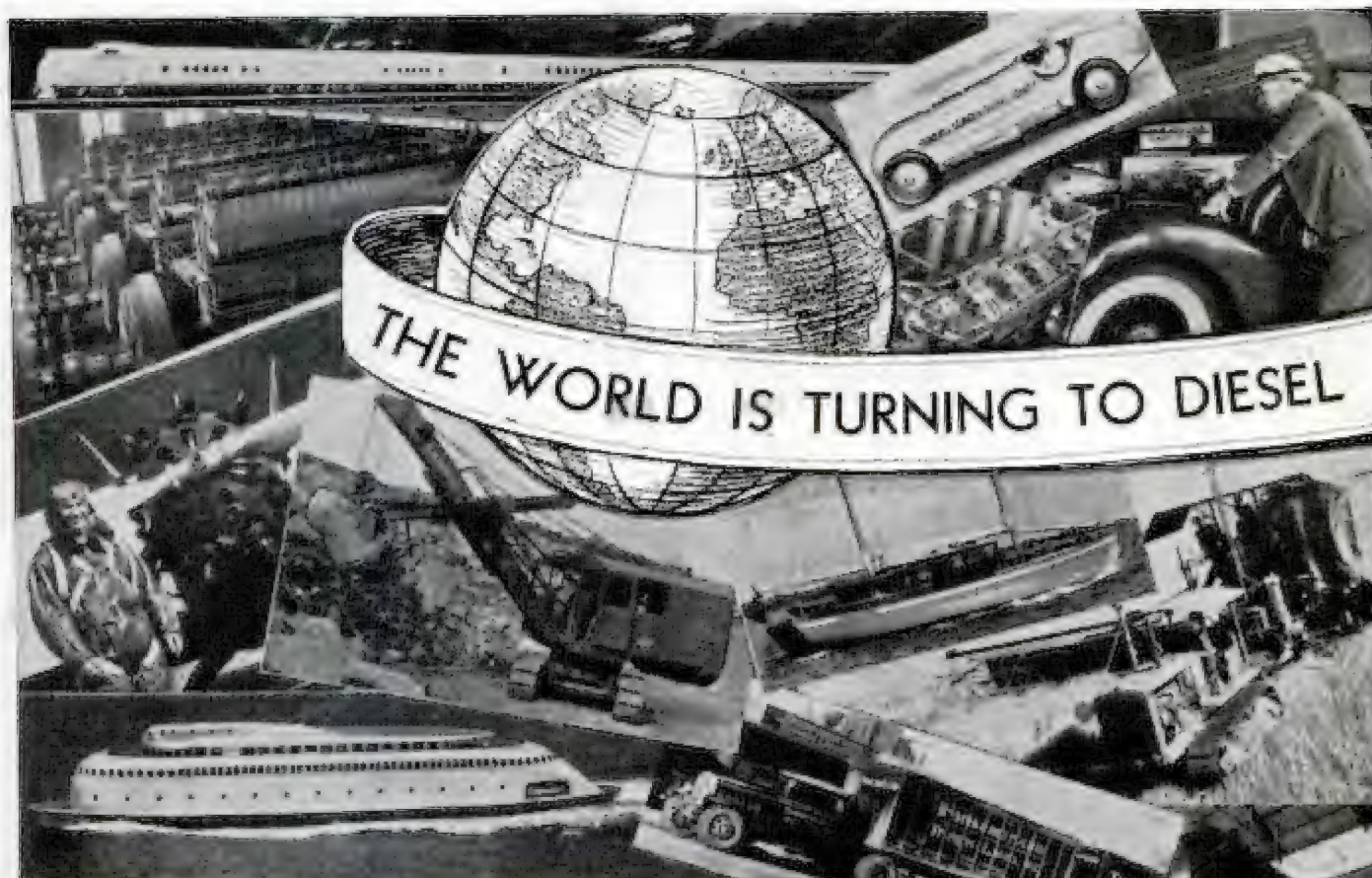
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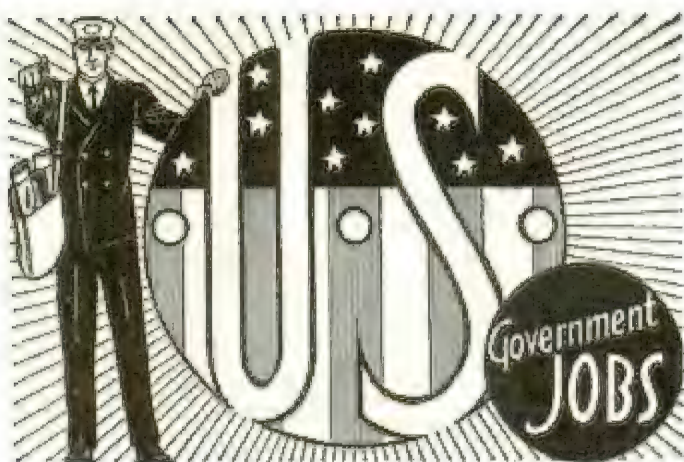
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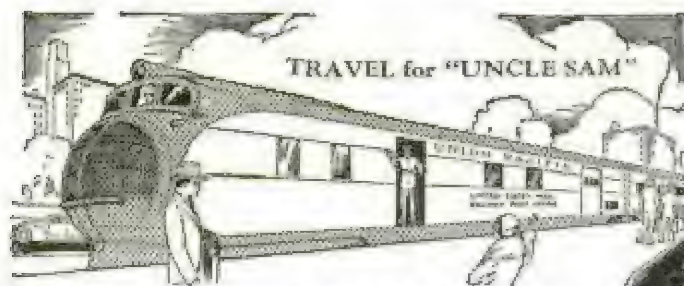
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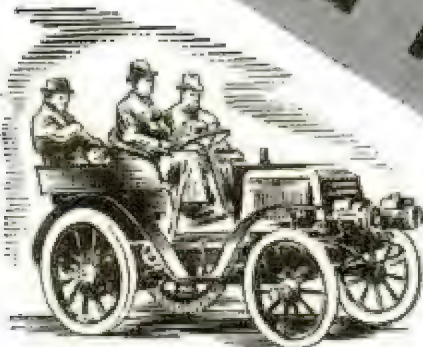
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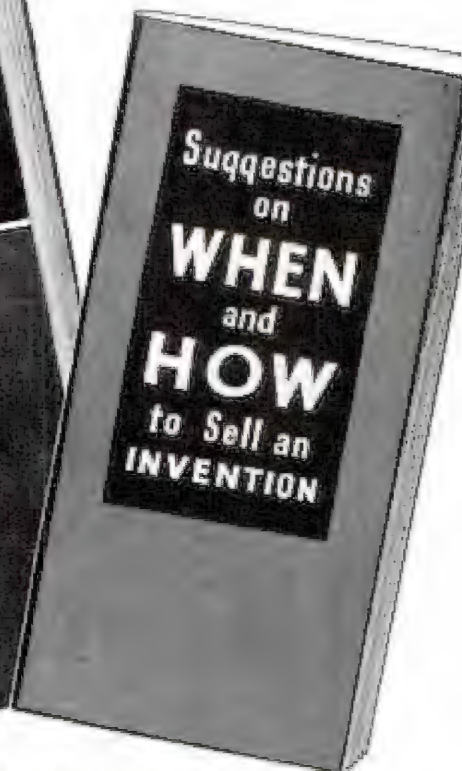
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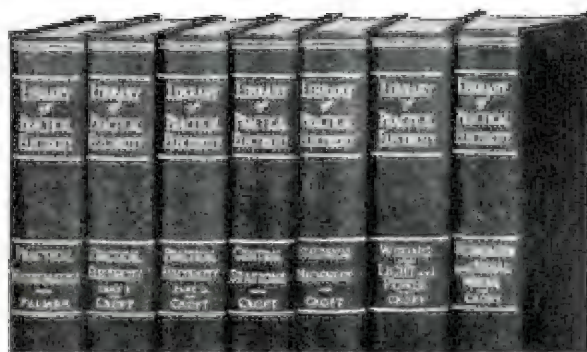
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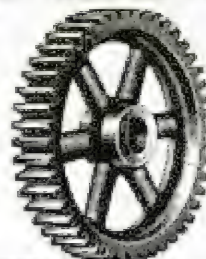
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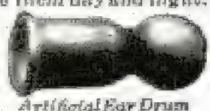
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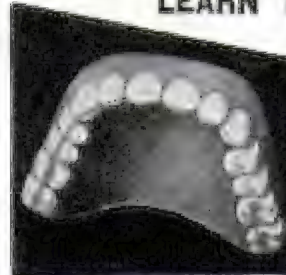
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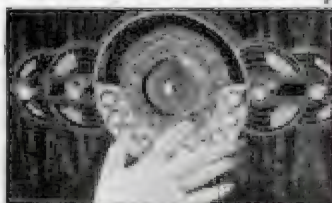


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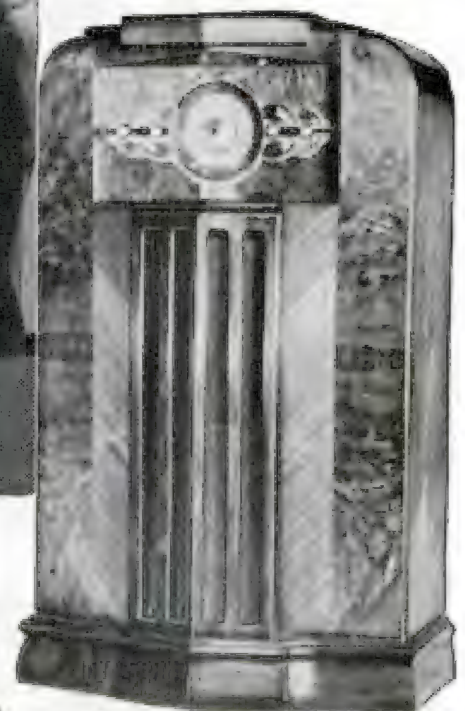
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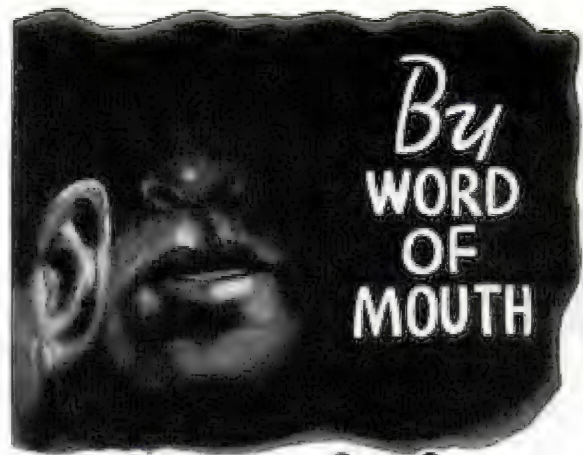
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(Continued to page 39A)

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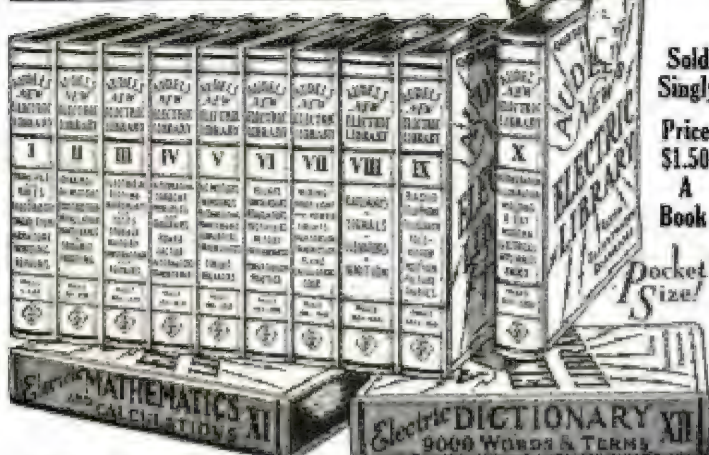
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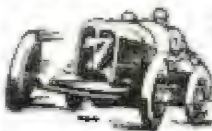
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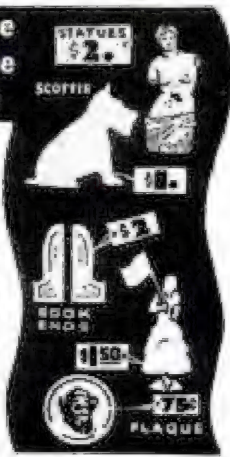
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STAMPS and COLLECTING

(Continued from page 36A)

found convenient. They are made of thin tough paper gummed on one side with a superior grade of mucilage.

A collector often tries to provide his own hinges by cutting up strips of gummed paper, labels or flaps from envelopes, but much of this gum may stain stamps, or change the color where hinged, and often it will be almost impossible to soak off the stamps when remounting the collection. The better grades of hinges are double-gummed, so the hinge may be peeled off the stamp without damage to its surface. A few kinds are too "peelable," with the result that the stamps fall off the page. These are even less desirable than a hinge which sticks to the end.

To apply the hinge so the stamp will not change shape, moisten only enough of the hinge so it will stick tightly to the stamp. It will be necessary to mount several stamps before you learn the strength of the gum, but rarely does any hinge require that more than one-eighth of an inch of its surface be applied to the stamp.

In practice, it is well to learn to use your tongs for mounting stamps. Begin by holding a stamp hinge between the thumb and forefinger of the left hand, gummed side down. With the tongs, fold up one-eighth inch of the hinge, moisten this folded end and apply to the back of the stamp with the folded line even with the top of the stamp. Now moisten about one-eighth inch at the other end of the hinge, and carefully place the stamp in a predetermined space in your album, pressing it firmly into place. The general appearance of the collection will be judged by the neatness displayed in mounting, rather than by the condition of the stamps.

Albums with printed boxes for each stamp are easier to use than blank albums, for the black lines of the box will cause the rows to appear lined up even though the stamps are not centered in each box. Stamps mounted on plain white pages must be very carefully lined up for any variation is noticeable. At one time there was a fad for mounting stamps on blank pages in intricate geometrical and artistic designs. This system has largely gone out of style in favor of pages mounted in strict

(Continued to page 43A)



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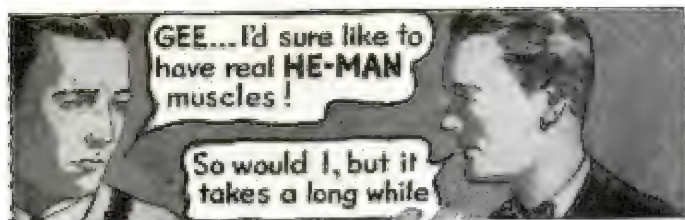
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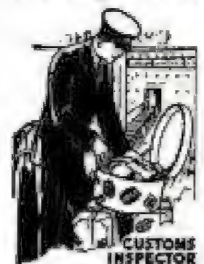
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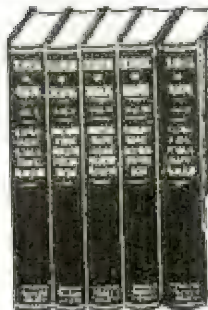
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STAMPS and COLLECTING

(Continued from page 39A)

gridiron fashion. Here the stamps are arranged in horizontal and vertical rows, spaced rather widely apart, and any notes or descriptive matter should be subdued. The stamps are the important part of the display, and fancy borders or intricate arrangements detract from the stamps themselves say those favoring a simple arrangement although many fine collections have been made in which the stamps were purely incidental to a display of chirography, or hand painting upon the pages.

Recent Stamp Issues

Historically interesting sets of stamps have been issued for the French colonies in America, Guadeloupe, Martinique, and French Guiana, to commemorate the three hundredth anniversary of the colonization of the Antilles. Those illustrated picture Belain D'Esnambuc taking possession in the name of France, on the forty-centime Martinique; Schoelcher and the Abolition of Slavery in 1848, on another Martinique; Richelieu, founder of the Company of the Antilles, on the fifty-centime Guadeloupe; Victor Hugues and his corsairs, on a second Guadeloupe; the Capture of Cayenne, by D'Estrees in 1676, on the fifty-centime French Guiana, and a native and the products of the colony on another.

A new French series of stamps has been issued to advertise the International Exposition to be held in Paris in 1937. The lower values especially are difficult to decipher. The new semi-postal stamp of New Zealand is an interesting example, and is known as the "keyhole" stamp. The vignette is shaped like a keyhole and shows a boy playing on the beach. These stamps were sold at two pence, half being for postage and half for charity. Brazil has issued stamps in connection with the First National Juridical Congress. The design pertains to justice and shows the balance and the tablets containing the ten commandments. An unusual set issued by Hungary in connection with the two hundred fiftieth anniversary of the recapture of Buda from the Turks is printed in photogravure. Another photogravure stamp is that issued by Yugoslavia for semi-postal purposes. It is one of a set picturing the

(Continued to page 45A)

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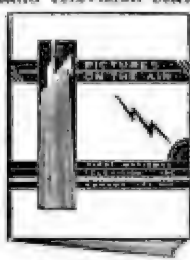
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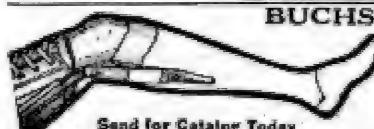
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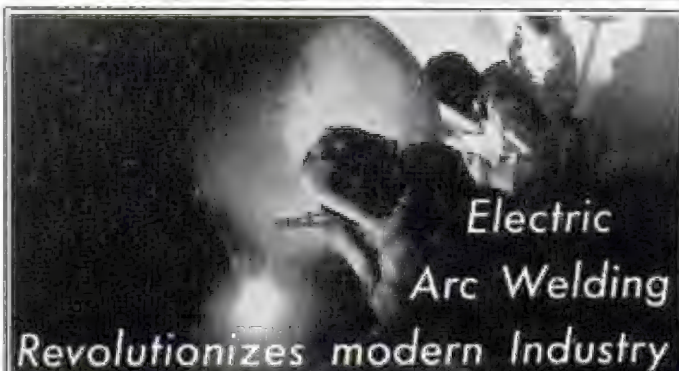
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STAMPS and COLLECTING

(Continued from page 43A)

queen mother of that country. Poland's most recent contribution is a pair of values to mark the holding of the Gordon-Bennett balloon races in that country.

Christmas Seals

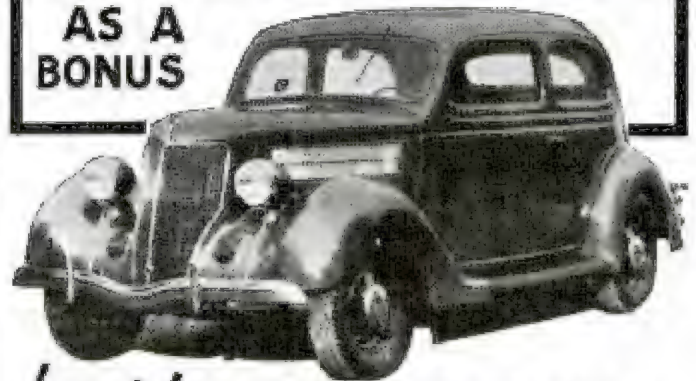
Each year finds more people collecting Christmas seals, and many confirmed stamp collectors have added this as a side line. The publishers of the specialized United States catalog have listed the regular American Red Cross and National Tuberculosis Association seals. There is the same incentive in making a collection of seals as in making one of stamps, for the seals are issued under authority, their sale is closely supervised and there is only one seal or set of seals each year. Some of the early dates of American seals are scarce and it may require much searching to complete a collection of dates without including any varieties. If the collection is not large enough to suit the individual, he may include seals issued by state and local organizations, and by foreign lands.

Coin Notes

Coin collectors and dealers have been spurred to activity by the offer of a Chicago dealer to pay full list price for certain United States twenty-five cent pieces minted between 1916 and 1924. This offer stated he was prepared to pay the full price in any coin list published prior to 1936. The quarters show a flying eagle on the reverse, a type which was only superseded in 1932 by the new design bearing the profile bust of Washington. The first of these coins was minted in 1916 and 1917 and was replaced in the latter year by a second type with three stars between the eagle and the words denoting the value. In 1925 the die was altered so the date is less liable to wear, thus removing the reason for the scarcity of the previous coins. In searching through quarters of this design you will be surprised at the number without any trace of a date. These are the coins minted between 1916 and 1924. To be of any value to a collector, the coin must show a fairly legible date, and to command a good premium, it must be uncirculated or nearly in that condition.

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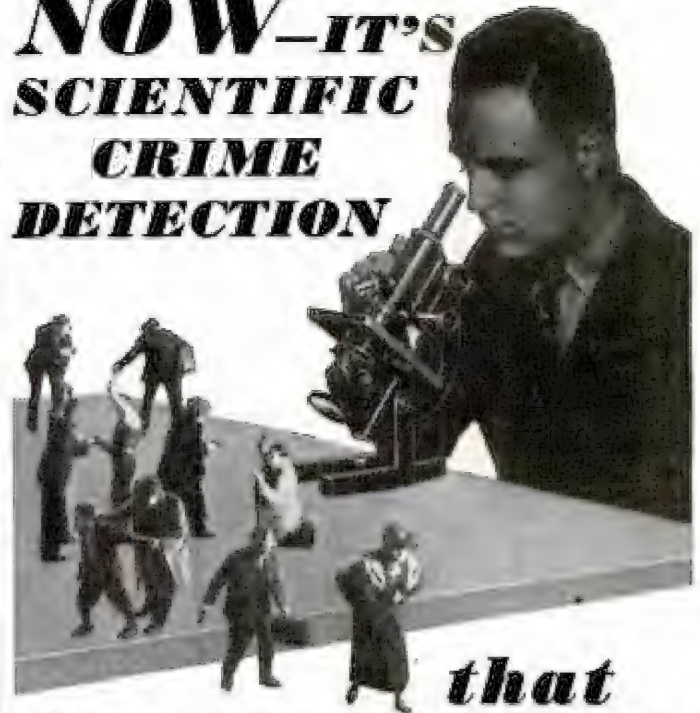
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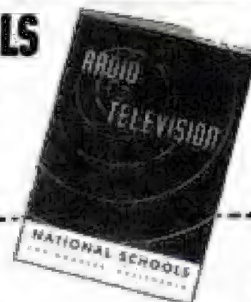
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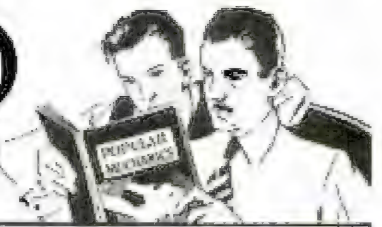
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MONEY Making business. Stock, dies, \$7,000. Patent grafts. Write H. Spies Co., Saginaw, Mich.

FREE Literature of latest plans. Kurtz, 25-41 84th Street, Jackson Heights, N. Y.

30 MONEY Making propositions 10c. Donahoe, 3848 Hammett, Los Angeles, Calif.

SUCCESS With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

NO HOSE! Sure cash! Silvering mirrors, autoparts, reflectors. Combination outfit. Write Sprinkle, Plater, 127, Marlon, Ind.

MAILING Service supreme. Will mail 10,000 circulars six by nine and up to opportunity seekers, etc., for \$5.00 per month. Guaranteed to please. Armour Organization, Flushing, New York.

WE Teach you new business, then buy your product. Write Superior Specialties, Springfield, Illinois.

CHEMICAL Expert furnishes manufacturing formulas with complete working directions. Reliable individual services. Charges reasonable. Dr VanHeeden, 1410 East 54th, Chicago.

SELL By mail. Books, novelties. Bargains! Big profits! Particulars free. B. Elton, 438 North Wells, Chicago.

"TURN Ideas into Cash." Free details. Martinez-P.M. San Bernardino, Calif.

LIQUID Marble—Anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberizable moulds. Composition flooring. Big money in these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

BUSINESS For yourself starting part time. Fully established in one year. Write NC Company, Leominster, Mass.

TO Win success you must do something different; particulars free. Publishers Sales Company, Box A-76, Nelson, Georgia.

CORRESPOND For newspapers. Profitable, interesting. Easily learned. Write Publishers' Service Bureau, 4238-F Drexel, Chicago, Ill.

OPERATE Amazing new vending machine business. Big profits. Wonderful opportunity. Propell-O-Lite Company, Mt. Washington, Ohio.

CHARTERS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

STOP Squealing—Start crowing!! Work mornings home—drive to country—"movies"—afternoons!! Unusual "plans." No canvassing! Prepare for surprise! National Photo-A. Station "D," Los Angeles.

MANUFACTURE Polishpuffs. Amazing proposition 10c. Particulars free. Hickory-dell, Glenheulah, Wisconsin.

ARTIFICIAL Marble sanitary flooring, instructions covering wood or cement flooring 1/4 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris Mahler, Elmont, N. Y.

MAIL Order business is your opportunity. Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 South 21st, Philadelphia.

BIG Mail 10c. Milton Boss, 2007M 34th St., Rock Island, Ill.

I WANT To send you proof of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, 200 E. Ontario St., Chicago, Ill.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

COMPLETE Chemical service, analysis, formulas, processes, trade secrets. Particulars free. W. L. Cummings, 228 Gordon Avenue, Syracuse, N. Y.

POPCORN, Crispette, caramels, potato chip, salted nut machines. Long Bakins, 1900 High St., Springfield, Ohio.

OPERATE Chain world's finest money making vending machines. Sells four products—same time. Instant success! Small capital—profits immediately. No curiosity seekers. Penny King, 1233 Chouteau, St. Louis.

MAIL Order and local business. All office. No canvassing; no stock; no shipping. Part of national chain. All instructions given. Shoestring capital. Circular free. Harrigan, P.O. Box 97, Drexel Hill, Pa.

"SCHEMER Magazine." Alliance, Ohio, prints schemes, ideas, business starters, formulas—big winners; \$10,000 to \$50,000 reported. 38th year; \$1.00. Trial special: six months only 30c.

START Little business anywhere. Everything furnished. No canvassing. Maywood, PM-923 Broadway, New York.

MONEYMAKING OPPORTUNITIES

WHEAT, Rice, corn puffing business. General information \$1.00. William Haffner, Clearwater, California.

10c BRINGS Copy National Mail Order News. Box 1773-PM12, Roanoke, Virginia.

NEW Business. No canvassing. Sell by mail. Merchants Sales, 617M North Second, Milwaukee, Wis.

\$250.00 BUYS Neon sign plant complete. Illustrated glass blowing book teaches you the trade. Learn the easy way. Earn big profits in neon signs. Details free. Wholesale Neon Supply, Sheboygan, Wisconsin.

96-GUARANTEED Money-making secrets—25c. Free examination. Schumacher, P1592 Monticello, Chicago.

"HOME-WORKER," 52 Page magazine for opportunity seekers. Sample dime, Year \$1.00, with valuable premium free. Order today. Alf Lybmann, 5623 So. Flores, San Antonio, Texas.

TRIAL Lesson free. Oil painting over photographic reproductions. Big money. Home study. Request instructions, Savigny's Studios, 2033 Park Ave., Detroit, Mich.

CAIICA Papaya (meat tenderer). Benzene crystals (amazing chemical cleaner). Powerpel Exzontite (strange expanding mineral). Free opportunity bulletins. Waldo, Box 268, Dallas, Texas.

STANDARD Opportunity to gain independence. Free bulletin. C. Makeenao, 1633 Burling, Chicago.

FREE Circulars describing hundreds of money making opportunities selling by mail. Build your own business. Write now. Progress Publishing Co., Box 1936-G, Milwaukee, Wisconsin.

FORTUNES in home manufacturing. Hooklet free. Ogg Laboratories, Tampa, Florida.

RED Bugs. Plenty people bothered. Will pay big prices for article to exterminate. We have it, give complete formula and many sales pointers for \$1. Particulars free. Guaranteed. Benton Co., 28 Buckley, Liberty, New York.

DOZENS Nationwide profitable offerings. Homework and outside. Stamp brings them. Evers, Box 66PA, Elmhurst, N. Y.

FREE Particulars about money-making opportunities. Sinclair, Box 861, Hollywood, Calif.

67 PLANS, 29 Formulas 25c. Jelsmith, 163 Myrtle, Waltham, Mass.

"PROFITABLE Ideas" Magazine, 6 North Dearborn, Chicago. Fifty money-making pages. 10c.

\$50.00 A WEEK. Even in spare time. 5c brings details and sample. Triborough Novelty Manufacturer, 213 Cypress Ave., New York City.

MILLIONS Jobs! Get dollars in mail daily, like we do, for amazing employment information (got man 76 jobs). Keep money; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo.

TURN Your home workshop into a factory and spare time into cash. Small woodturning lathe only power tool required. Actual photo, pattern with complete dimensions and manufacturing instructions for ideal novelty gift article which finds ready market at dept. stores and gift shops sent you postpaid for 25c coin and 6c in stamps. Order now. Don't delay. H. R. Olverson, Woodcraft Service, Plainview, Minnesota.

WISE Home worker and spare time money makers will send immediately for free details of new "Silent System" business. No canvassing. Harry Julius, Amarillo, Texas.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

BIG Opportunities waiting. Why worry about strikes, lay offs, or no money. You can have all now at once. Spare time, full time. Sunday work. The first 500 who send us full details about themselves together with 25 cents, get a special big surprise gift free, when we send you your big opportunity bundle. Money back if dissatisfied. Particulars free. Armour Organization, Flushing, New York.

1000 MONEYMAKING Ideas, book 50c; literature free. Harvey Teeple, Decatur, Ind.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers, by late method. Experience unnecessary. Free particulars. Gunmetal Co., Ave. N, Decatur, Ill.

BIG Profits from ordinary ashes! Finished product in great demand. Raw material found everywhere. Write for details of money-making secret. Adolph Ringle, 12524 Moran, Detroit, Mich.

PROSPERITY For home workers, 52 page magazine. Sample, dime. Sizemore, 4917 N. Kostner, Chicago.

FORMULAS, PLANS, ETC.

MAKE A real stove cleaner. Guaranteed. Formula 50c. P. Schuller, 1928 University Ave., Bronx, New York.

GUARANTEED Formulas—New fast sellers. None better. Lowest prices. Catalog free. Kemico, 49, Park Ridge, Ill.

FORMULAS, Analysis, literature free. Herstein, Chemist, 222 Ransom, Grand Rapids, Mich.

MAGIC Soap, cleans everything. Money maker. Formula 30c coin. Fair Deal Agency, Amarillo, Texas.

EXTRAORDINARY—Wealth using formulas. Large catalogue free. Brown's Formula, 212 East Waters, Tampa, Florida.

ANY Formula 30c or money back. Catalog free. Ogg Laboratories, Tampa, Florida.

NU-BEAUTEE Face cream formula \$1.00 guaranteed. Sanquist Mfg. Co., Pomeroy, Iowa.

MAKE Own products, more profit. Latest guaranteed formulas, trade secrets, plans. Catalog, special offers free. C. Philaret, Jefferson City, Missouri.

CERTIFIED Formulas, best science can produce for making popular, biggest-selling specialties. All lines. Before buying formulas, get my valuable "Eye-Opening" literature, including free subscription to Miller's Monthly Messenger. Miller, Chemist, 1706-A, Tampa, Fla.

TEN Good formulas \$1. Geo. W. Van Pelt, Madison, Ohio.

ANTI-MIST; Anti-freeze! Genuine guaranteed formulas, both 25c. Duffy, Covington, Ky.

500 MONEYMAKING Formulas, 25c. Womble Co., Silver City, N. C.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, RD-1142 Sunnyside, Chicago.

ANYTHING Analyzed. Guaranteed formulas, Process for tenderizing meats. Associated Chemists, Indianapolis, Indiana.

SUCCESS With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

ANY Formula \$.50, three \$1.00. Cole Laboratories, Bryant Pond, Maine.

FORMULAS—Latest money makers. Literature free. Belfort, 4942 N. Keeler, Chicago.

CHEMISTRY

SEND 25c For new illustrated chemical experiment book with over 500 formulas and tests. Also receive 32 page illustrated catalog of apparatus, microscopes, telescopes and chemicals free. Z.Z. Winn, 124 West 23 St., New York.

FREE Chemistry catalogs. Supplies at 5c. Equip complete laboratory. Send 10c (refundable) for postage and handling. Kemkit Corporation, 135P Johnson Street, Brooklyn, New York.

CHEMICALS, Laboratory glassware, apparatus. Send 3c for catalog CP. Biological Supply Company, 1179 Mt. Hope Avenue, Rochester, New York.

RESEARCH, Experiments, magic—three months subscription 15c. Spammers Chemistry Magazine, 100 Forsyth, New York.

EXPERIMENT With Latex. Dime brings literature. Xmas special. Eastern Latex Labs., Box 94, Norfolk Downs, Mass.

THRILLING Miniature chemical laboratory and instruction book, complete, \$3.00. Safe-Chem, New Haven, Conn.

25 CHEMICALS With experiments, 50c. Kayars Chemical, 5522 P. Ft. Hamilton Parkway, Brooklyn, N. Y.

CHEMICALS In 5c quantities. Catalog 5c. Fleischer's Laboratories, Everett, Massachusetts.

HELP WANTED

MAN Wanted—Manufacturer established 46 years will finance responsible man with complete stock of guaranteed food, farm and household necessities—you pay when sold. Mighty attractive proposition. Good living right from start with steady increase for industrious man. Big value combination deals, premiums and fast-selling specials now in effect. Jacob Van Dyke of Michigan sold \$441.31; Maurice Vander Haar of Michigan sold \$376.15; and B. M. Anderson of Utah sold \$530.55 in one recent week. Pleasant outdoor work. Experience not necessary. No slack seasons or layoffs. Write today for "No-Investment" offer. McCann and Company, Room 60MS, Winona, Minnesota.

USE \$500.00? Raise canaries for us. Free particulars. Canary Guild, 3741-B, 60th Street, Woodside, N. Y.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-H, 1936 S. Troy, Chicago.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. H. J. Graves, Pres., 1300 Harrison, Dept. N-817, Chicago.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 14A.

MAN And wife—to run local coffee agency. Earnings up to \$240 in a month. New Ford sedan given you as bonus. I send complete outfit. You don't risk a penny. Details free. Albert Mills, 2245 Monmouth, Cincinnati, Ohio.

MECHANICALLY Inclined men to demonstrate. Specialty Sales, 4303 Roscoe, Chicago.

BECOME A business investigator. Make money in your spare time. Pleasant work. Good fees. Details free. Business Detective System, 1009 Oak Street, Elmira, N. Y.

AGENTS WANTED

AGENTS—Lowest prices—Top profits on famed aspirin, razor blades, handkerchiefs, laxatives, shoe laces, etc. Details free. Better Products Co., Dept. 2718, Marion, Ind.

AGENTS. 90% Profit on \$1.00 sales. Cleaner for autos, metal and glass. Your name on labels. Free sample. Instant Kleen Lab., Dept. E, Dayton, Ohio.

300% PROFIT In new self-starting no-flint cigar lighter. Retail 50c. Sample 25c. Get details quick on wander seller. New Method Co., Box PM-49, Bradford, Pa.

STRANGE Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Neverknot, Dept. 1A, 4523 Ravenswood, Chicago.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, Danellen, N. J.

AMAZING New product plates with real silver. Fast sales to housewives—big profits—one minute demonstration. Write quick for details. Puritan Laboratories, 1012P Summit, Akron, Ohio.

\$6.00 HOURLY. Amazing Karnu refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karnu, Dept. K-8, Cincinnati, Ohio.

AGENTS For new metal cleaner. Send for sample and proposition. Storey-Johnson, 119 Federal, Pittsburgh, Pa.

AGENTS: Smash go prices. Santos coffee 12c lb. 4-oz. vanilla 84c. Razor blades 10 for 84c. 100 sticks chewing gum 12c. 150 other bargains. Premiums. Experience unnecessary. Carnation Co., P.O. St. Louis, Mo.

SELL Leading mechanics hand soap, good profit, repeat business. Write Radium Compound Co., Phoenix, N. Y.

BUSINESS Opportunities. Flavor bargains. Chemical service. Free literature. Herstein, 222 Ransom, Grand Rapids, Mich.

NEW Cleaner—Amazes everybody. Cleans everything. Washes clothes snow-white quickly. Spots, stains removed like magic. Startling demonstrator. Free samples make fast sales. Quick repeater. Immense profit. Write quick for "free sample." Super-X Cleaner Co., 11, Berwyn, Illinois.

BE Your own boss! Operate used-new clothing business from store, home, auto. 200%-300% profit. Everything furnished. Catalogue free. Portney, 560-G Roosevelt, Chicago.

300% PROFIT Selling new "20-In-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. \$7.20 a gross. Sample 10c. New Method Co., PM-49, Bradford, Pa.

DRIVING Master shows miles per gallon when driving. Analyzes motor. Described page 369 September Popular Mechanics. Driving Master Company, Sioux City, Iowa.

\$0.85 HOURLY! Amazing No-Flat fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flat, Dept. K-172, Cincinnati, Ohio.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 14A.

AGENTS Wanted selling new patented article. Write, Richards Rubber Co., Dept. 5, 288 Valley St., Providence, R. I.

FREE Clothing, big money daily selling quality raincoats, jackets, overcoats. Lowest prices! Samples free! Goodwear, 712-AB Roosevelt, Chicago.

450% PROFIT In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PM-49, Bradford, Pa.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, R-3004 Lincoln Ave., Chicago.

SILHOUETTE Pictures. Entirely new. Fast, profitable sales guaranteed. Write for illustrated literature. Vandrey Service, Truman, Minnesota.

LEATHER Necktie 50c prepaid. (Agents.) Washable, durable, beautiful. Anderson-Simplex Co., Anderson, Indiana.

WHOLESALE Catalog free. 500 best sellers. Paty Co., 1167 Broadway, Somerville, Massachusetts.

MEXICAN Feather pictures. Christmas novelty, 50c (stamps) bring \$2.00 worth samples, details. Refunded if unsatisfied. Mexican Art, Apartado 1533, Mexico City.

SELL Neon signs. Big profits. Sample—\$3.95. Free details. Wholesale Neon Supply, Sheboygan, Wisconsin.

NEED Money quick? Here's a genuine opportunity to make up to \$42.50 in a week. Operate grocery business from your own home. Supply friends, neighbors, others. I send complete outfit on 30-day trial; no money risk. Details free. Albert Mills, 2248 Monmouth, Cincinnati, Ohio.

SPARKLING Tinselled Christmas signs—5c. Retail 25c. Sample free! Boxed, 21 Christmas cards. 25c—retail 85c. Make Christmas money. Department 679, L. Lowy, 8 West Broadway, New York.

MAKE More money selling shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Sales outfit free. Nimrod Company, Department 8, 4922-28 Lincoln Avenue, Chicago.

NEW Fountain brush uses 6 colors. Makes signs without skill. Every merchant buys. 250% profit. Vandrey Signs, Truman, Minnesota.

SELL—Blade conditioners—Smoother shaving, millions being sold. Marvelous. Order sample, details quick. Twenty-five cents. Chariton Corporation, Chicago.

MEN—Women, tremendous profits. Sell famous Eldore perfumes—beauty products to women who demand the best; popular prices. Write for details. Eldore, 299 Madison Ave., New York.

AGENTS! Dresses 53c, men's suits \$1.50-\$2.00, shirts 46c, ties 64c, chiffon hose 42c. Amazing prices. Big profits. Catalogue free. Acme, Alt-558 W. Roosevelt, Chicago.

\$1.00 MONTHLY. Maintains New York office. Co-Operative Mail Service, -126-H Lexington Avenue.

PROFIT With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, BD-1142 Sunnyvale, Chicago.

DOLLARS Daily. Start manufacturing; mail order businesses. Details. Duffy, Covington, Ky.

\$8.00 A WEEK. Even in spare time. See brings details and sample. Triumphant Novelty Manufacturer, 213 Cypress Ave., New York City.

"THERMOLITE Re-Power." Brand new motor compression seal. Fast-seller! Big profits! Guaranteed! Write quick. Free sample. Electro-Thermolite Works, Peoria, Ill.

AGENTS Wanted. Every car owner prospect for Sta-Charg, adds life and pep to car battery, money back guarantee. Thousands satisfied users. Send fifty cents for sample. Amasco, 6715 Hollywood Blvd., Los Angeles, Calif.

AGENTS—200% Profit. Selling collection system \$1.50 complete. Results guaranteed. Every merchant extending credit needs one. Samples on request. Send 10c for mailing and packing. Hill Agency, 5777 Violetlawn, Detroit, Mich.

LEGITIMATE Spare-time income opportunities. Free literature. Charlton, Box 6310 West Market St., Philadelphia, Pa.

NO Boss! Sure cash! Silvering mirrors, autographs, reflectors. Combination outfit. Write Sorlukle, Plater, 128, Marion, Ind.

WANTED—Monument salesmen. Men, ladies make good money. Outfit free. Write Factory Manager, A-23, Oneco, Florida.

SUCCEED With your products. Make-sell them. Formulas. Processes. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

WHY Work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Valuable book free. Scientific Laboratories, 1950W Broad, Richmond, Va.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers, by late method; experience unnecessary. Simple plan of manufacturing at home starts you in big money making business. Free particulars and proofs. Gunmetal Co., Ave. H, Decatur, Ill.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 428-B North Clark, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Rulco," 1084 Washington, Boston, Mass.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

STOP Squealing—Start crowing! Drive to country—"movies"—afternoons. Work mornings—home. No canvassing! National Folio-A, Station "D," Los Angeles.

SELL Novelty fun cards, novelties, etc. Samples 10c. National, Box 506M, Cincinnati.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

COSTS 1c—Sells 25c. Make non-explosive cleaner from benzene crystals. 1c gallon. Sample 10c. Literature free. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

DO You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents" is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

SALESBOARD Men—New put and take jars. Details, samples free. Tom Thumb, Dept. PM, Nauvoo, Ill.

GUARANTEED Double-edged blades 50c hundred up. If there's anything else you want, write us; we have it. Samples sent. Steven Spencer, 412 E. 51st, Brooklyn, N. Y.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

AGENTS, Distributors—Why constantly seek new territory? Sell new improved Dutch-Maid, Non-competitive monthly repeater, Cleans toilet tank bowl and trap. Unusual profits. Home Helpers Co., Dept. P, 321 Virginia St., Buffalo, N. Y.

BIG Profits eyeglass necessity. Cleans, polishes, prevents steaming. Sample ten cents. Shurbert Chemical, Hartford, Conn.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

HIGH-GRADE SALESMEN

SALESMAN—To contact industrial concerns; profitable, fast-selling line essential to all shippers; full or part time; immediate results; yearly renewals. Write Official Motor Freight Guide, 732 Van Buren, Chicago, Illinois.

BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4347-D Ravenswood, Chicago.

DISTRIBUTOR—For nationally advertised non-poisonous liquid rat-kills, insecticides, soap, etc. Small investment, exclusive territory. Address Drawer C, Towson, Maryland.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$240 weekly. Ferrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

NEW Drycleaning clothes brush. Revolutionary invention. Cleans clothes like magic. Homes, offices buy instantly. Phenomenal profits. Outfit free. Kristee, Dept. 262, Akron, Ohio.

NEW Punched card line. Free 32 page full color catalog. Nothing to carry. Larger cash commissions daily. Season now! Lea-Moore Co., 180 Adams, Chicago.

NEW Chemical fluid—Prevents blur. Keeps store windows, windshields and all glass surfaces clear in cold weather. Just what merchants are looking for. Send 25c for sample. Morgan Chemical Company, 423 Strawberry Street, Harrisburg, Penna.

DRAWING Account to acceptable experienced broom salesman. Anne Broom, Sodaalia, Mo.

GOOD Seller. Pickle, olive, cherry fork. Nickel plated. Sample ten cents. Kubik & Sons, Michigan City, Indiana.

CAN You sell? We have it to sell. Let's get together and sell it. Peachy Novelties, Poplar Bluff, Missouri.

MAKE \$100 Weekly presenting unique guaranteed "Prosperity Plan" for stores. National, 1451 Broadway, New York.

DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh's, Dept. A-U-PPM, Freeport, Ill.

SELL Only (4) all wool suits to get yours without cost. No limit to number of suits you may earn. Prices \$14.95 to \$24.95. Zipper leather carrying case. Sample line free. No experience needed to make big money. All suits individually cut and tailored to measure. Satisfaction or money back guarantee. Three Star Clothes, Dept. 26E, 530 So. Franklin, Chicago.

MAKE More money selling shirts, ties, underwear, dresses, hosiery, raincoats, jackets, pants, uniforms. Sales outfit free. Nimrod Company, Department 65, 4922-23 Lincoln Avenue, Chicago.

TRUCK Covers. Complete line waterproof canvas. Thousands of trucks in your state constantly buying. Open price line. No competition. Michigan Tarpaulin Co., Grand Rapids, Mich.

MAKE Money and give protection against fire at the same time—Firex—Automatic Fire Extinguisher and Alarm assures double protection. Recommended by fire chiefs, insurance men, etc. Unlimited prospects—good commissions. Write for territory and testimonials. Firex Corporation, Dept. A-103, 516 South Broadway, St. Louis, Missouri.

EXCLUSIVE Territory for established auto route jobbers. Steady profitable demand for every store counter. Bur-Lite, Hudson, Ohio.

NEW 3rd Hand holds your flashlight. Sell to dealers. Sample and proposition, 25 cents. McMaisters, Groton, New York.

AMAZING Invention! New electric hot water heater. Sells on 60 second demonstration. Needed in every home. Makes up to 133% profit each sale. Exclusive territory to right man. Write today. Industrial Laboratories, Dept. 200, Des Moines, Iowa.

EXCLUSIVE! Advertising book match factory wants salesmen: full or part time. G. B. made \$77 in 1 day. Big comm., amazing repeats. Permanent, dignified business. Samples free. Write Match Corp. of America, Dept. E-1, 6041 Grand, Chicago.

FREE Suits and cash profits. Earn cash profits, prizes and free suit for selling five all-wool tailored-to-measure suits. No limit on free suits you may earn. No experience necessary. Free sample outfit. Prices from \$17.50. Money-back guarantee. Frank Knight Tailoring Co., Not Inc., 316 W. Van Buren, Dept. CL, Chicago, Illinois.

BOOK Match salesmen cleaning up! No dull season. Cash commission with order. Free kit. Full or part time. Gem Match Co., Dept. 51, 72 W. Washington, Chicago.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Boulevard, N. Y.

SALESMEN-AGENTS, Free. Join Direct Selling Legion, world's largest organization of salespeople. Founded to raise standards of direct selling and afford full service and protection. Button, Gold Seal identity card and monthly magazine free. No fees, dues or assessments at any time. Send name and address today for membership application. Direct Selling Legion, Dept. AD, 397 N. Michigan Ave., Chicago, Ill.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, New Jersey.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elliot Co., 214 Grand St., New York.

SALESMEN—New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2301-123 Sheffield, Chicago.

SOMETHING New in fire extinguishers—Red Comet Automatics. Proved in west five years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

BE Independent. Own your business; experience unnecessary, selling \$10,000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lefcourt Bldg., Newark, New Jersey.

EDUCATIONAL AND INSTRUCTION

BE A radio expert—Many make \$20, \$50, \$75 a week. Learn at home in spare time. Radio's big growth making many good full time and spare time jobs. Write for free copy of 64-page book, National Radio Institute, Dept. 7APA, Washington, D. C.

"SHORTHAND Simplified" (complete) \$1.00. Free lesson. Erskine Simmons, Cromwell, Conn.

BIG Bargain catalogue educational matter 10c. Hanfling, Y-799 Broadway, New York.

WORK For "Uncle Sam." \$105-\$175 month. Men-women. Many 1937 appointments. Try next examinations. Common education sufficient. Qualify now. Influence unnecessary. Full particulars, list jobs and sample tests—free. Write today sure. Franklin Institute, Dept. T3, Rochester, N. Y.

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QUALITY Printing, lowest prices, free samples. Excel, 6325 Maxwell, Detroit, Mich.

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\$1.00 EACH—250 Envelopes, 250 letterheads, 250 statements. Postpaid. Hustler, Advance, Indiana.

PRINTED Quality stationery. Samples. Triangle, 601 West 127th Street, New York.

1000 LETTERHEADS, Envelopes, postcards, 6x9 circulars—\$2.95; 2000, \$4.95. (Envelope slips, \$1.75; 2000, \$2.50 prepaid.) Samples. Goodprint, Harrisonburg, Va.

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CARDS, Envelopes \$2.00 per 1000. Statements, letterheads \$3.00 per 1000. Skulnick's Printing Service, 205 Broome Street, New York.

LETTERHEADS, Envelopes: 500, \$1.00, 2000 3x5 envelope slips, \$2.00. 1000 enameled blotters, 3 1/2 x 6 1/4, \$4.00. BPress, Box 103, Station W, Brooklyn, N. Y.

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GOOD Printing. Reasonable. Samples. Harmon Company, 318 South Tenth, Philadelphia, Pennsylvania.

500 GUMMED Stickers, 3 1/2 x 2 1/2, 4 lines, 30c. Catalog, 10c. Lambing, 6457P Eggleston, Chicago.

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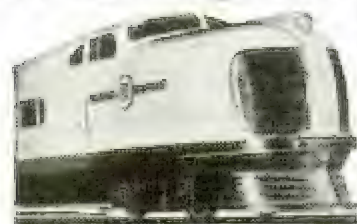
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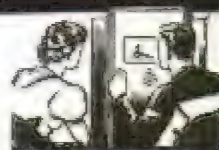
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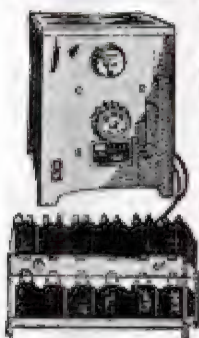
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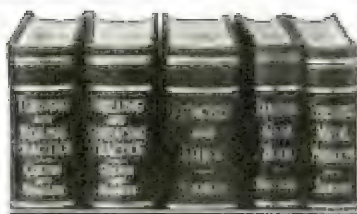
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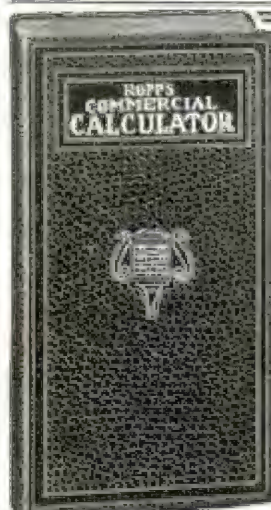
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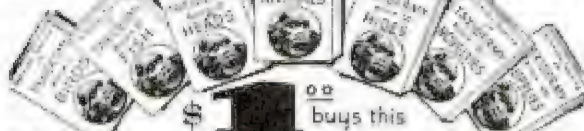


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This course has meant advancement to hundreds of ambitious men, mechanics, draftsmen, blacksmiths, foundrymen, patternmakers, apprentices, and mechanical engineers—men who wanted to get ahead and to earn more money. You will find, as they have found, that enrolling for an I. C. S. Course is an investment in a Bigger Future. Use the coupon!

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A Coming American Industry



Courtesy "Diesel Power"

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are always in demand

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Without obligation, send me full information on subject checked below:

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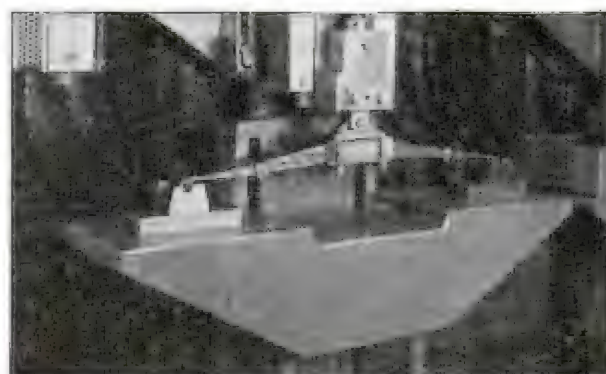
No Wonder GENUINE FORD SPRINGS STAND UP!



Two HUNDRED THOUSAND pounds per square inch! That's the tensile strength of the steel in a Genuine Ford Spring. It's an example of the standards of quality to which Genuine Ford Springs are built.

Every batch of steel used in making Ford Springs is carefully analyzed. It must meet rigid specifications established by Ford engineers. Only a high-grade oil-hardened chromium steel is used.

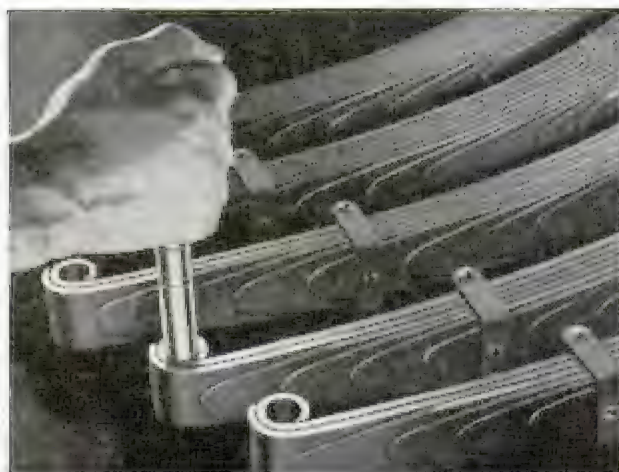
Test springs made up of leaves from the various batches of steel are being constantly subjected to rigorous tests on one of five machines built exclusively for spring testing. And an



(Above) Heating steel sample in electric furnace at Ford Testing Laboratories.
(Below) Fatigue Test equivalent to more than 10 years of usual service.



Springs for 1937 Ford V-8s are provided with an oil groove for interleaf lubrication as shown at left.



Plug gage inspection of Ford Spring eyes.

example of the precision used in manufacturing Genuine Ford Springs is the fact that the inside diameter of spring eyes is held within limits of two thousandths of an inch.

Quality materials, uniformity of materials, precision manufacture, rigid tests and careful inspections — these are the things that insure Ford quality in Genuine Ford Springs as well as all other Genuine Ford Parts. These are the things that mean you get full value when you buy Genuine Ford Parts.



FORD MOTOR COMPANY

DEARBORN • MICHIGAN

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 67

JANUARY, 1937

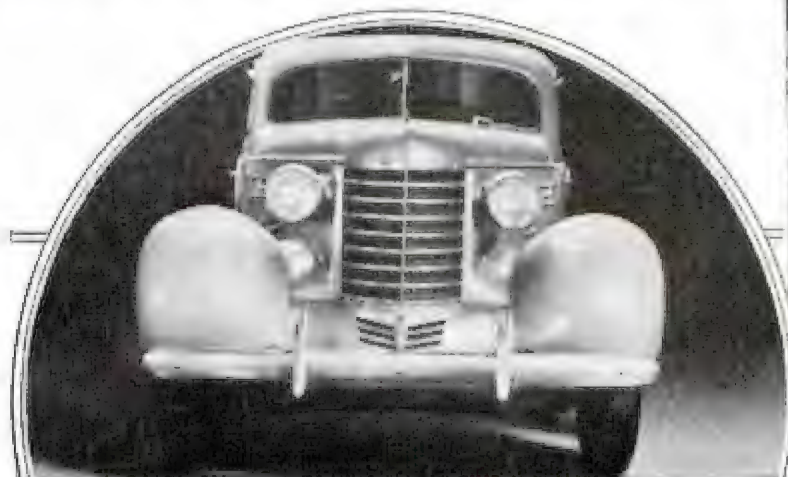
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EASIER MOTORING *for* 1937



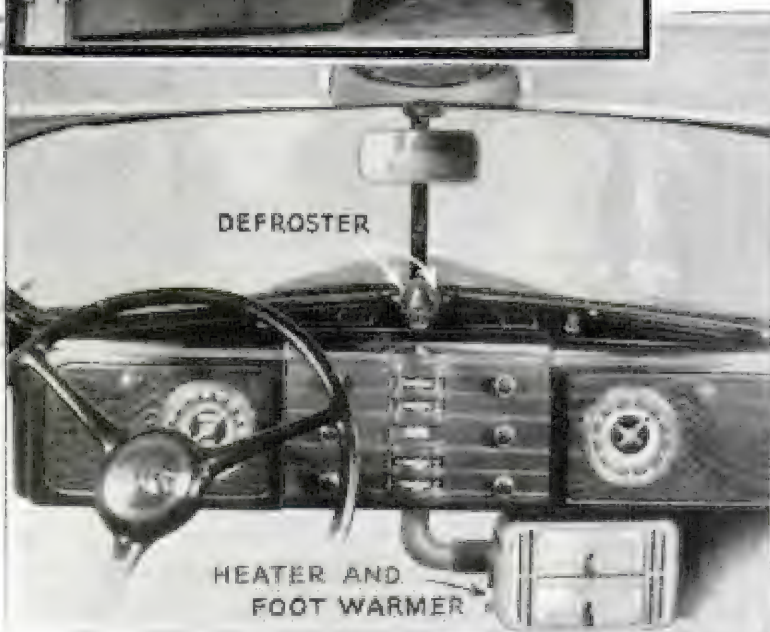
By Julian Leggett

IF ALL the 1937 models could be condensed into one automobile, the owner would find it more economical, more powerful, roomier, safer and considerably more comfortable than its 1936 counterpart. And this hybrid would contain many hints of what the future holds for the American motorist. Better streamlining, more



Top, striking photo of new Willys. Right, full-car view of Willys. Left, distinctive front end of the Oldsmobile "6," showing unusual grille distinguishing it from the eight-cylinder car

Willys - Overland Co. Sold in Ohio

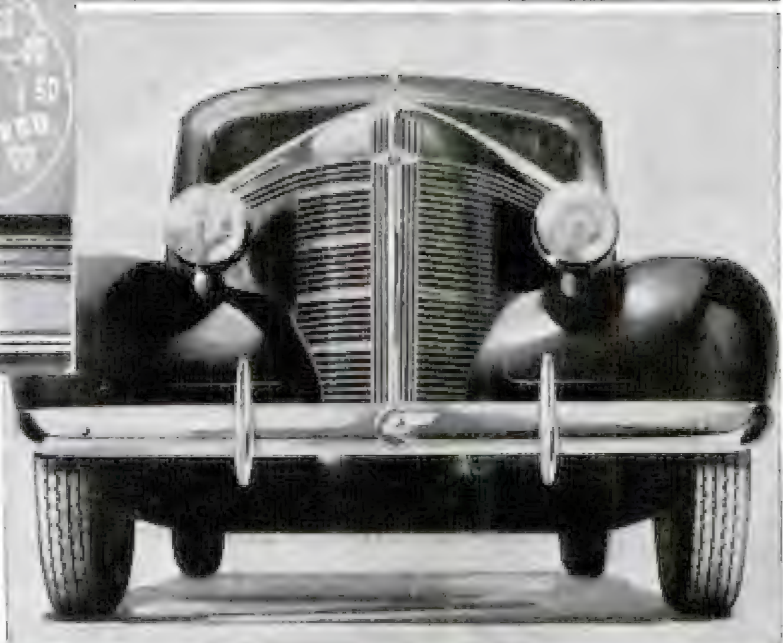
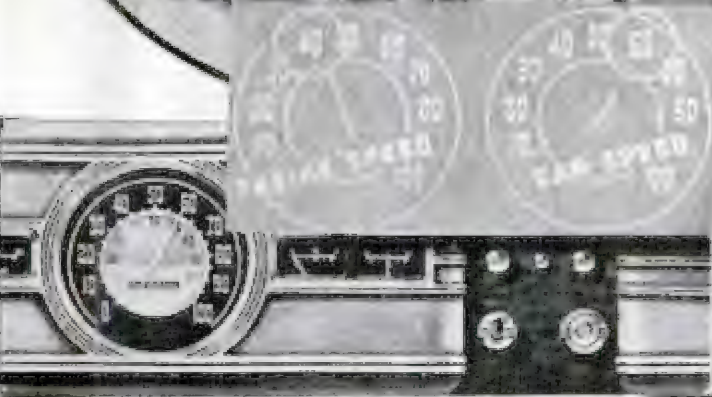
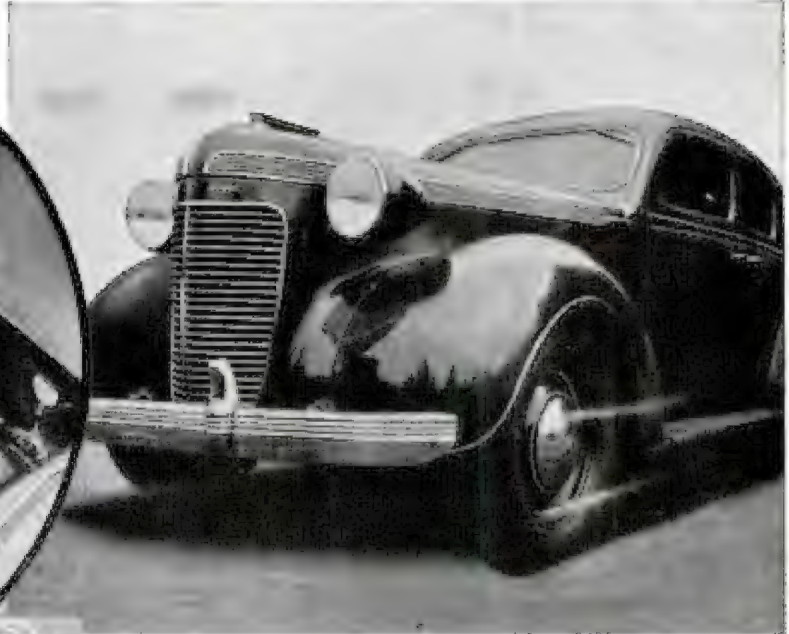


nearly automatic regulation of controls, better gas and oil mileage and drastic reduction and simplification of service mark the new cars. Just around the corner is the automatic transmission. A new system, said to be free from objections which resulted in the discard of earlier transmissions, is scheduled for introduction on a car in the class just above the low-price field. This transmission has been tested for hundreds of thousands of miles without major repair, engineers report.

One manufacturer, in the 1937 models, offers the "electric hand," which was introduced sometime ago, an automatic clutch and a selective automatic shift as optional equipment. Nearest thing to the automatic transmission, this combination system has entirely automatic clutch action and a governor which limits coasting or free wheeling to sixteen miles per hour or less. Gear changes are made when the driver's foot is lifted from the accelerator and the engine is idling. The driver is free to select the gear he desires.

Almost universal adoption of certain features marks the 1937 models. These include: roomier bodies and larger baggage compartments; wider windshields set at a sharper angle; defrosting vents built into the instrument panel for connection to the heater; hypoid rear axle which permits lowering the over-all height of the car without the inconven-

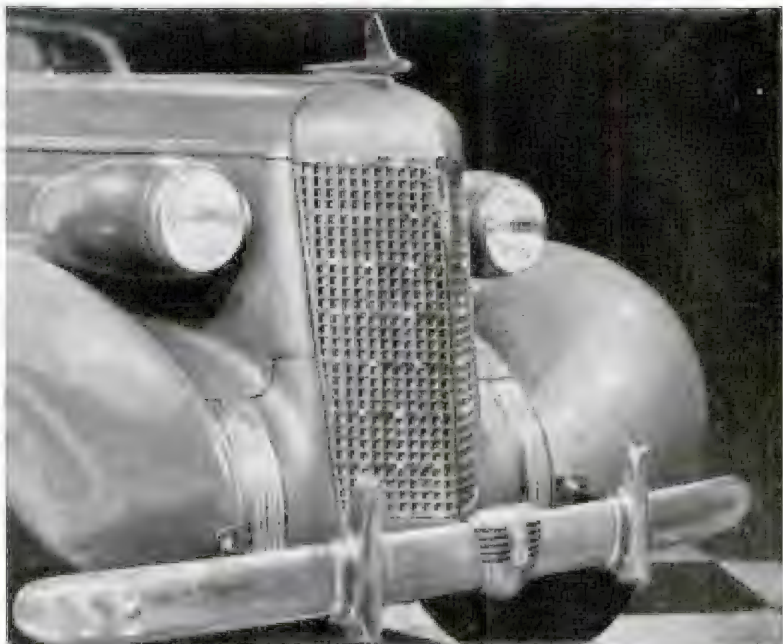
Top, fleet-appearing Chevrolet. Center, interior of Plymouth, showing chair-height seats and instrument panel with recessed controls. Bottom, heater and defroster in supercharged Graham



Top, circle, servicing Hudson-Terraplane battery under hood. Below, speedometer on Nash with cruising gear shows car speed and engine speed in miles per hour

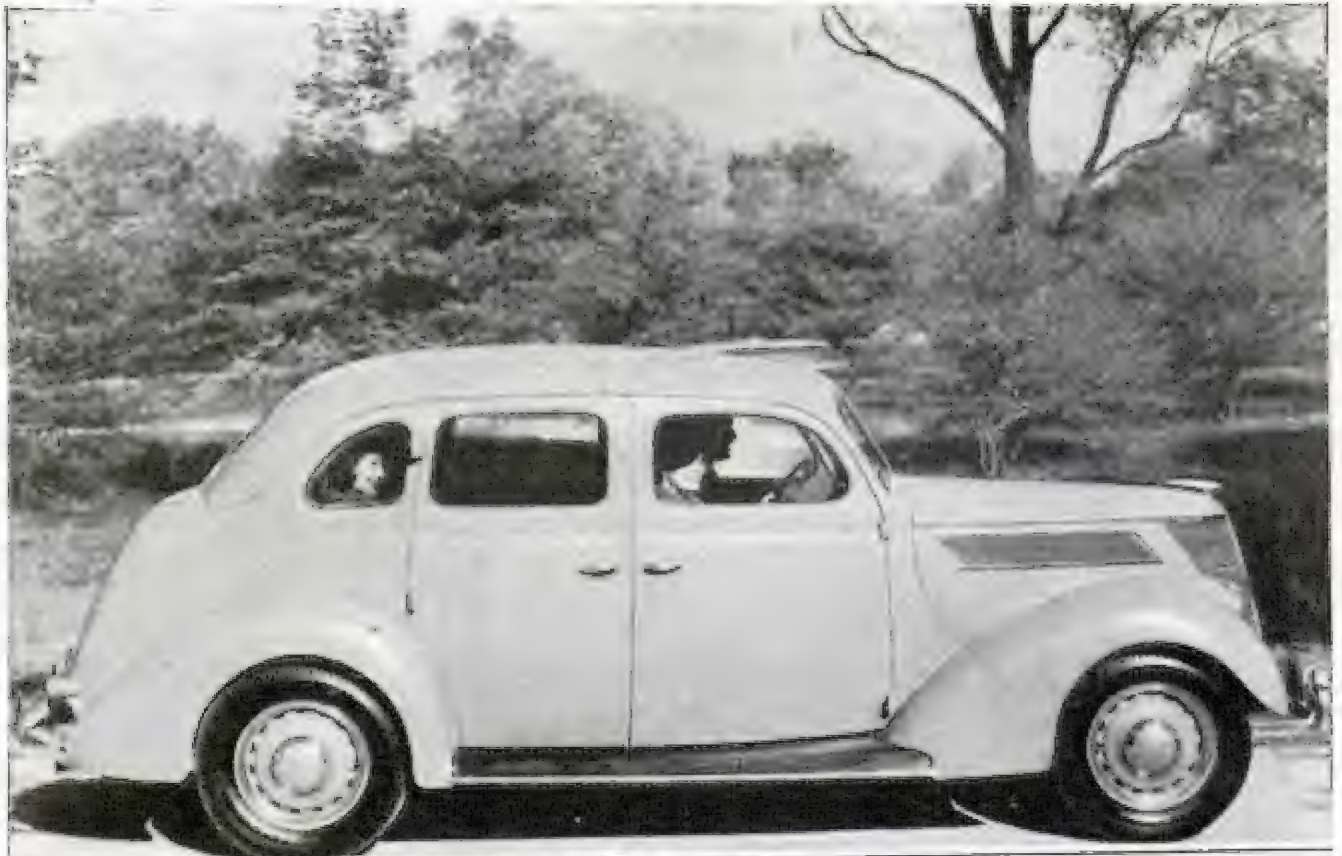
ience of a tunnel through the rear compartment; relocation of the license-plate brackets at the rear center instead of at the side; longer wheelbase and more horsepower with lower gear ratios to attain driving speed more quickly; higher compression and improved carburetion for better engine performance and economy, and steel wheels, either with large hubs and short spokes, or disk.

Occupying a prominent position in the new car parade is the Ford, available in de luxe models with an eighty-five horsepower engine and in standard models with either the eighty-five or a sixty-horsepower engine. Both are V-eights. The sixty-horsepower motor, offered for the first time, is designed to meet the public demand for economy without sacri-



Top, unusual appearance of new Chrysler Royal. Center, head-on view of Pontiac "8." Bottom, Oldsmobile "8." Note novel headlamps and grille

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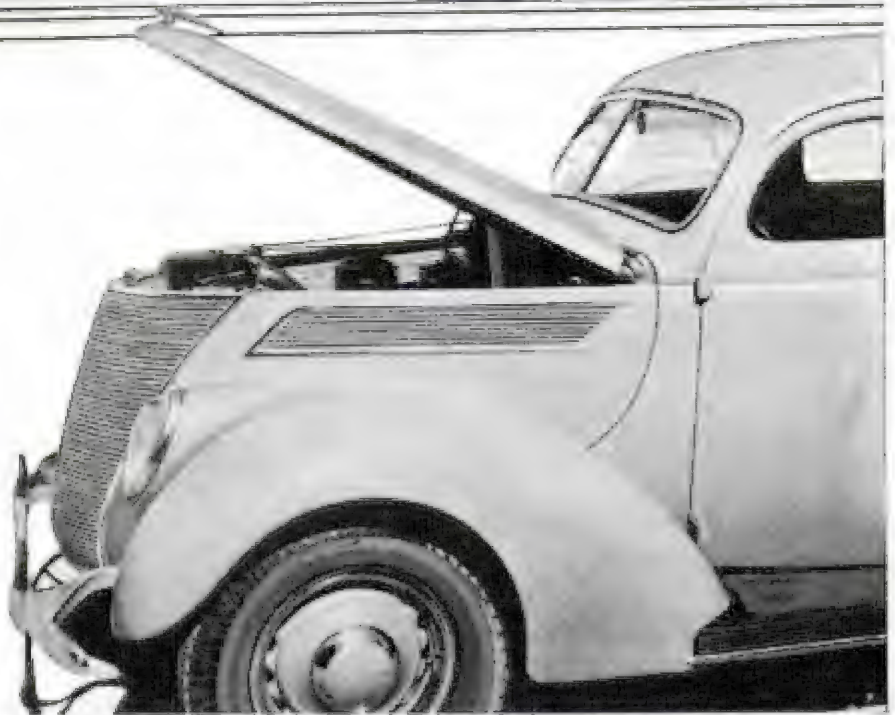


ficing too much in performance and in car size.

Ford also offers an all-steel body with one-piece steel top and new brakes which are actuated through a cable-and-conduit system and have controlled self-energizing action. Styling closely resembles that of the Lincoln-Zephyr.

The new Willys returns to standard tread and offers ultra-modern styling, all-steel body and top and a forty-eight horsepower engine which tests up to thirty-five miles per gallon of gasoline under normal operating conditions. Wheelbase is 100 inches but the body is longer than in 1936.

Claims of forty-five to fifty miles per gallon are made for the twenty-horsepower engine of the American Bantam, a new-comer. While the Bantam replaces the midget Austin in the field, it differs from that car in that it was engineered for American highways. Harry Miller, builder



Top, photo of the new Ford. Note resemblance to Lincoln-Zephyr. Bottom, showing how hinged hood raises at front for servicing

of racing-car engines, is understood to have designed the Bantam's four-cylinder motor which has a speed above sixty miles per hour. Operating costs are said to be three-fourths of one cent per mile for gas, oil and tires.

Unusual treatment of body lines gives the new Chevrolet an appearance of fleetness which is ably borne out by the redesigned valve-in-head engine. Develop-

American Bantam

ing eighty-five horsepower, the motor has higher compression than the 1936 power plant and gives greater gasoline mileage and increased acceleration. Combustion chambers and piston heads are slightly dome-shaped to improve performance, the crankshaft has four bearings instead of three to assure smoothness, and the manifolding system has been revamped to assist carburetion.

The body is all steel from roof to floor, welded together to form a silent unit. Not a bolt, nail, rivet or screw is used and even the doors are steel. Safety glass all around is standard equipment. Use of the hypoid rear axle has lowered over-all height and the center of gravity to give greater road stability. The car is roomier, being five inches wider at the floor line in the front compartment. In keeping with the universal trend more space is provided for baggage.

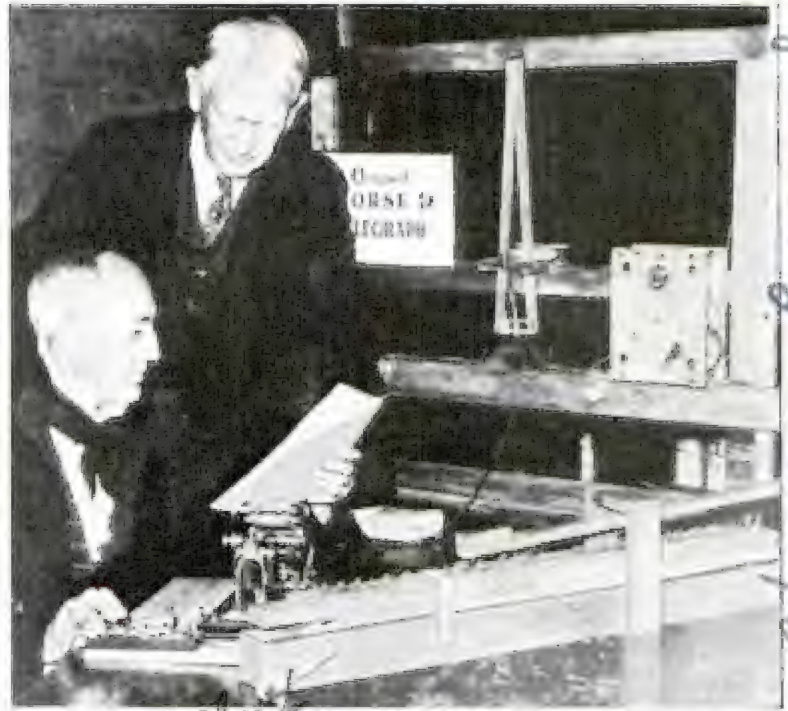
Hypoid rear axle, safety interior, airplane-type shock absorbers, improved insulation against noise and dirt, higher engine compression, and a new method of mounting the body on rubber cushions are features of the Plymouth, the Dodge, DeSoto and the Chrysler Royal.

The safety interior introduced on Chrysler-built cars, except the Airflow, includes an instrument panel with recessed controls, padded roll at back of the front seat, top door handles curved inward to prevent snagging the clothing, windshield wiper control and armrests of soft rubber, silk cord instead of metal robe rail and smoothly rounded surfaces—the objective being prevention of injury to occupants.

In the Royal, Chrysler offers a new entry for the lower-price field. Powered with a ninety-three horsepower engine and equipped with independently sprung front wheels, this car has the distinctive Chrysler front end. Its motor is serviced by raising the front of the hood. Chrysler Imperial is propelled by a 110-horsepower eight-cylinder engine and the Custom Imperial by a 130-horsepower engine with automatic overdrive. The Airflow also has the high-power motor and overdrive.

(Continued to page 143A)

First Trans-U. S. Telegraph Is Seventy-Five Years Old



Mr. Howard Seligsohn
Sending original message on telegraph instrument used seventy-five years ago to send first trans-U. S. telegram

Members of the Oregon Trail Memorial association recently celebrated the seventy-fifth anniversary of the completion of the first transcontinental telegraph line. The links linking the two coasts were brought together at Salt Lake City and the first message was transmitted from San Francisco to the White House in Washington in 1861. The celebration was marked by re-transmission of the first message, the same instrument used in 1861 again being used. Replicas of the first telegraph instruments invented by Samuel F. B. Morse in 1836 were also displayed during the anniversary celebration.

Hone for Fishhooks Sharpens Barbs and Points



As an addition to the tackle box, a small hone for fishhooks is available. It is made of fast-cutting electric furnace abrasive and may be used wet or dry. One curved side is used for sharpening the barbs and the flat side for the points.

Operator - Edison & Brewster

Wisconsin Abrasive Co. Milwaukee Wis.

Smoke Clouds Test Masked Troops for War



Top, officers wearing gas masks "advance" through smoke clouds in training course intended to familiarize them with war conditions. Bottom, creating smoke cloud with portable chemical guns. These projectors depend upon the wind to carry the smoke

cal agents. These cylinders are dependent upon the direction of the wind as the smoke must be freed at the place of installation to be blown by the wind to the target.

Students of the army chemical warfare service school, located in Maryland, are given practical training in the use of smoke and chemical agents. The students, who are officers of the army, navy and marine corps, travel through smoke-filled air to familiarize themselves with conditions of actual warfare. Masks are worn by the officers to prevent harmful effects. Across the training ground may be found another group of students engaged in creating the smoke cloud, releasing the smoke from portable chemical cylinders which are used to project non-persistent chemi-

Electricity Kept in Cold Storage in Wire Near Absolute Zero

Electricity can be "bottled" in a wire at a temperature near absolute zero and kept in cold storage without noticeable loss of energy. Turn a current through a short loop of wire at 458 degrees below zero Fahrenheit for eighteen hundredths of a second and the current will remain in the wire for days, like water in a hose, if maintained at that low temperature. Hooked up to a circuit, it will then flow out without appreciable loss due to stor-

Al Edgewood

Chicago Tribune 10/30/36

age. Scientists hope this laboratory development will prove to be the first step toward actual efficient storage of power and long-distance transmission at low cost. Lead, tin, mercury and certain other metals become super-conductors at low temperatures, losing their resistance to electricity. Physicists express the belief that a thread of lead no greater than the strand of a spider's web would, if kept near absolute zero, carry all the power developed at Niagara Falls to San Francisco without loss. The problem is either to find metals which are super-conductors at higher temperatures, or to find cheaper methods of maintaining low temperatures.

F1384

Midget Car Has Three Wheels

With a two-horsepower motor under its tiny hood, a three-wheeled French automobile operates economically on a basis of about eighty miles to the gallon of gasoline. It seats only the driver, and travels about thirty-one miles an hour. The car weighs only 264 pounds.

No information



One-passenger French car with single rear wheel goes eighty miles on a gallon of gasoline

How Worn-Out Ship Sinks

N.Y. Is Caught by the Camera



Top, left, towing condemned ship to sea. Center, ship settling after opening of seacocks. Other photos show stages in ship's sinking

When the owners of a worn-out ship scuttled it recently off Honolulu, a photographer made a pictorial record of the sinking. The craft was the steamer "Mauna Kea," one of the first mail boats to ply the islands of the Hawaiian group. The photographer snapped his first picture as the ship was started on its last trip, in tow, out of Honolulu. In succession came photographs of the ship as the seacocks were opened, letting in the water, the gradual settling of the craft and then the final plunge, with one end in the air, as the mail steamer sank to the bottom three miles out at sea. The Pacific at that point is so deep that the sunken craft will not interfere with surface travel.

Silver-Sided Luxury Train Is Speed Champion

#1394



Twelve-Car "Denver Zephyr" on its record-making speed run, and interior views showing alternating-current outlet and individual radio in bedroom

Inter-car telephones, wall outlets for alternating current in the men's and women's dressing rooms, individual radios in every bedroom, drawing room and compartment and an "air curtain" that shuts out all kitchen odors from the dining room are some of the luxuries introduced by the Burlington railroad on its "Denver Zephyrs." The twelve-car stainless steel train, hauled by 3,000-horsepower Diesel-electric

locomotives, was recently placed in overnight service between Denver and Chicago. One of the twin trains established a long-distance speed record on its first run, covering the 1,017 miles in twelve hours, twelve minutes and twenty-seven seconds for an average of eighty-three and four-tenths miles per hour, and touching a top speed of 116 miles per hour, sustained for one mile.

HITCH *your* WAGON to a CAR



nomad 16 foot.
STREAMLINE trailer which adds little to the fuel bill. Roger Babson says more than half of us
will be living in trailer homes in a few years.

Hollywood Trailers, 1315 Wilshire



A stylized illustration of a train and two cars on a track. The train, on the left, is white with a blue stripe and a yellow stripe. It is pulling two white cars. The car in the middle is a sedan, and the car on the right is a pickup truck. The background is a warm, orange and yellow wash, suggesting a sunset or sunrise. The style is simple and graphic.

WE are getting ready to live on wheels. The exodus from the American home is under way by a tax-ridden population clamoring for independence and freedom of movement.

Within twenty years, he said, more than half the population of the

In other words, if Mr. Babson is right, you have more than an even chance of calling a trailer coach your home within two decades. Uprooting half the people of the country and starting them out in rolling homes within the space of a few years seems preposterous until we take a look at this trailer business—perhaps the fastest growing industry in America today.

Five years ago a trailer coach was a novelty. The man who owned one had no privacy because curious throngs hammered on his door, peeked in his windows and demanded information on costs, upkeep, comfort, ventilation, miles per gallon and a hundred other subjects. That should have been a



*Streamliner
Clipper.*
MODERN trailers come in
just about every size and
shape, as indicated by the
group above. Right, stream-
line trailer built of ply-
wood which is light and sturdy.

\$395.00 up



7980

(1)

Cherid. W. 1980

1980



W. Street
Cliff
395.00

A TRAILER family, above, enjoying city conveniences in a rural setting miles from the nearest village. Left, vacation time has become trailer time for thousands of people today.



Borlus Road Chief 1936

COMMODIOUS interior of a large trailer home. Note the yacht-like arrangement of furnishings to take advantage of every inch of space.

F980

warning of what was to come, but no one heeded except a few canny individuals who now are swamped with orders for trailers.

Today it is estimated there are on the road about 100,000 homemade and outmoded trailers owned and still used enthusiastically by the pioneers of modern nomading who built their own. It is also estimated there are 200,000 or 250,000 of the newer type coaches, the majority of them factory-produced. That makes an estimated 300,000 or 350,000 trailers of all types rolling over our highways today. But that's only part of the picture. Trailer manufacturers say they could have sold 300,000 trailers in 1936 if they could have built that many. But the industry, even though growing mushroom-like, could hardly supply one-fourth that number. Even so, conservative manufacturers estimate that 400,000 trailers will be produced and sold annually by 1940.

By then, if not before, there probably will be 1,000,000 rubber-tired "cottages" on our roads.

(3)

Who is using or trying to buy all these trailers? Most trailer owners at present fit into one of three classes—vacationers or campers, retired couples too restless to sit still and people who live in trailers permanently. There are said to be 100,000 of the latter class today, couples and families who move with the climate and call home wherever they park. Their number is increasing every day.

At present the majority of trailer owners use them for vacations, week-ends and camping trips. These people have found the trailer offers them the advantages of a summer cottage at a fraction of the cost—and in addition, the rolling home is not anchored to one spot. While these people do not live in trailers permanently, they do utilize them for part-time living.

F980
Highway
Pullman
Co.



COMPACT camping trailer with kitchen in rear and bunks forward. Below, note the extra baggage space at the rear of this streamline trailer.

14. Real estate and housing are affected by another angle of this trailer business. Modern trailer coaches are finding favor as permanent homes with many types of people. A rolling home is not plastered with real estate taxes, the original cost is lower than even a modest dwelling, the upkeep is low and the retired couple or those whose professions are in general demand are free to move about, following the sun, their professions or just plain fancy.

No less remarkable than the trailers themselves are the new arrangements for accommodating trailer tourists. Trailer colonies and camps are springing up everywhere, notably in Florida and California. The large ones are laid out in streets and have complete water and electric service carried right to the door of the trailer. Many have community buildings with baths, laundries, stores and clubrooms. Fees are as low as a dollar a week for the whole family.



The tax collector is taking notice of the trailer, but as yet trailer taxes are confined to license fees which, in most states, are considerably less than a dollar per 100 pounds of weight. Trailer coaches are finding a wide appeal for commercial purposes, and the traveling salesman now travels by trailer, living in the coach at night and using it as a display and sample room to demonstrate his wares by day.

Camping Room \$7.00



There are two organizations of trailerites and other auto campers and tourists, the Tin Can Tourists of the World whose annual winter meetings at Sarasota, Fla., attract upward of 1,000 trailers and trailer owners, and the more recently formed Automobile Tourists' Association.

Your money buys a lot of conveniences when you buy a modern trailer. In the low-priced range, from about \$350 up to \$900, you can get a camp coach for four people. It probably will be about twelve feet long, more than six feet wide and have inside headroom of about six feet. Construction probably will be partly of wood and partly of metal with leatherette exterior finish and equipment might include two double beds serving as settees in the daytime, a folding



old model

GALLEY of modern trailer, complete even to an electric fan and a stack for carrying off cooking fumes and heat from the gasoline stove. Top, trailer interior, showing the many built-in fixtures.

South Los Angeles
Transportation Co.

Explorer.



FOLDING camp furniture carried in this trailer makes an outdoor living room for the family when the weather is comfortable.

table, cupboards, an ice box, a sink, two-burner stove using gasoline as fuel, a bath basin built in the floor, a ten or twelve gallon water tank and perhaps a radio.

If you have \$1,000 or so to spend, you can get a trailer about twice as large and with more elaborate furnishings. Construction may be all-metal or nearly so. Above \$1,500 you run into the de luxe, custom built coaches and in the \$15,000 field you will find the land-yachts, luxuriously equipped and constructed to distribute all stresses in the sides and provide maximum strength with minimum weight. Trailers in any of the price classes can be purchased on time-payment plans like cars are sold, and fire, theft and other forms of insurance are being written for them. Many states are preparing to pass trailer laws dealing with maximum length and width, and types of lights and brakes to be required, but as yet there are comparatively few regulations.

Virtually every trailer manufacturer adds his own individual touches to his product, and many ingenious devices are found in these rolling homes to make them more

(Continued to page 132A)

Automatic Stoker Handles Coal and Ashes

Not only can you let an automatic "hired man" shovel coal on your furnace fire, but he will carry out the ashes as well. A mechanical stoker which feeds fuel and removes ashes without raising dust through the house was exhibited recently at a trade exposition in Chicago. An enclosed screw acts as feeder.



Pointing out the screw-feed on the automatic stoker which loads coal mechanically and also empties the ashes

Theory of Heart as Pump Discarded by Japanese

Denying the 300-year-old theory that the heart pumps blood, Dr. Katsuzo Nishi of Japan advances the contention that blood circulates largely through capillary action. He believes that the heart is no pump but merely an elastic tank which helps regulate and control the blood stream. His theory is the basis for a health system which claims a million adherents in Japan.

Streamline Hood on Motorcycle Used to Boost Speed

In attempts to establish a new world's speed record, a German rider is using a streamline hood on his motorcycle. The

hood is expected to reduce wind resistance and increase speed considerably. The driver awaits head or tail winds on his trial runs because the hood offers too much resistance to cross winds.



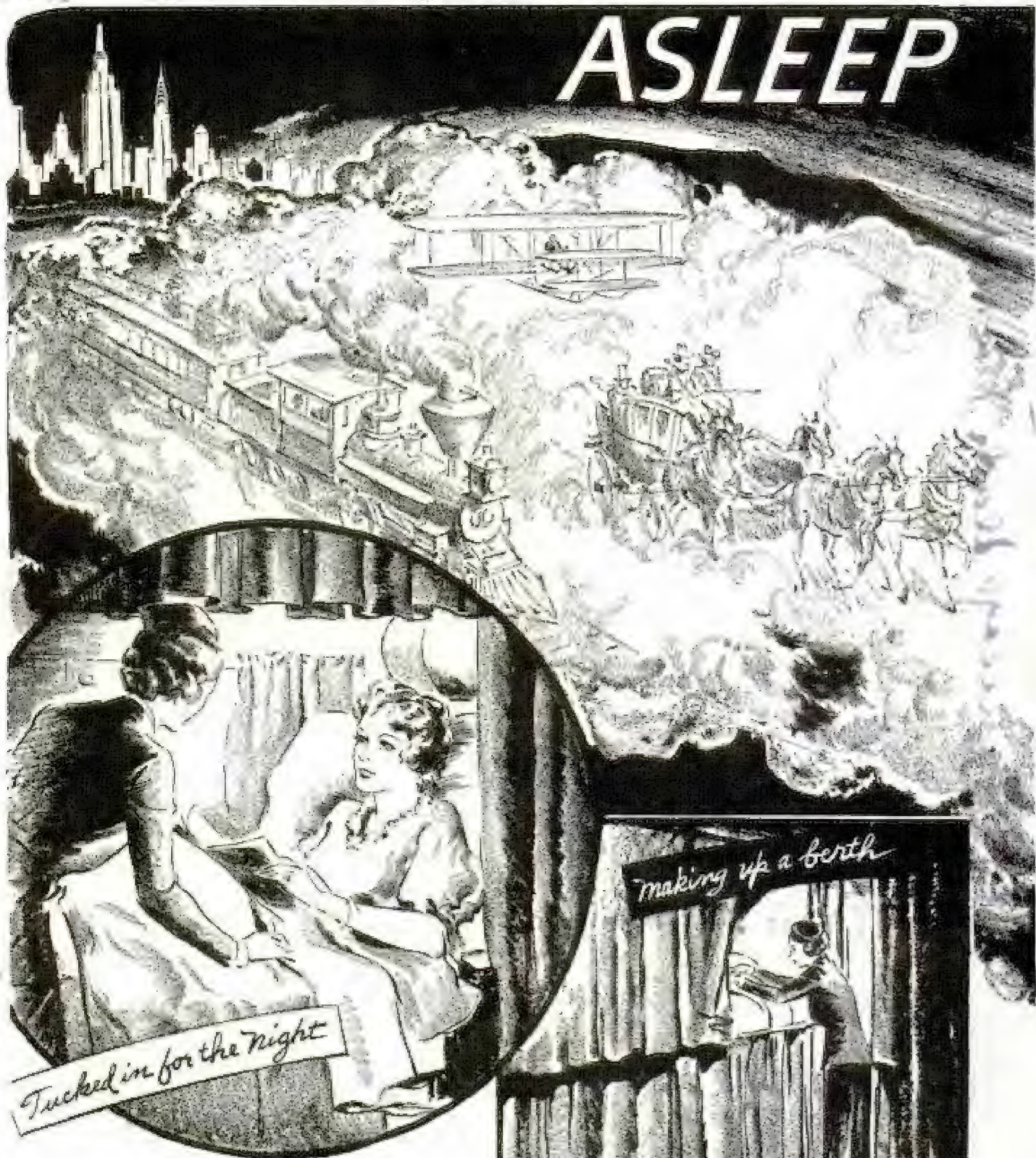
Protecting the rider from the windstream, this hood gives motorcycle more speed

Red Golf Balls to Be Used on Arctic Course

Golf on the Arctic ocean with the midnight sun and the northern lights to illuminate the course is the plan of the hardy "sourdoughs" in the Point Barrow region of Alaska. They would drive red golf balls over this all-ice course, and its nine holes would have plenty of natural hazards—icebergs and polar bears, and now and then a water hole during the summer thaw. Dr. R. W. Maurer, government physician at Barrow, a golf enthusiast, says he has found an ideal spot to lay out a course.

The average depth of the ocean is estimated at two and one-third miles.

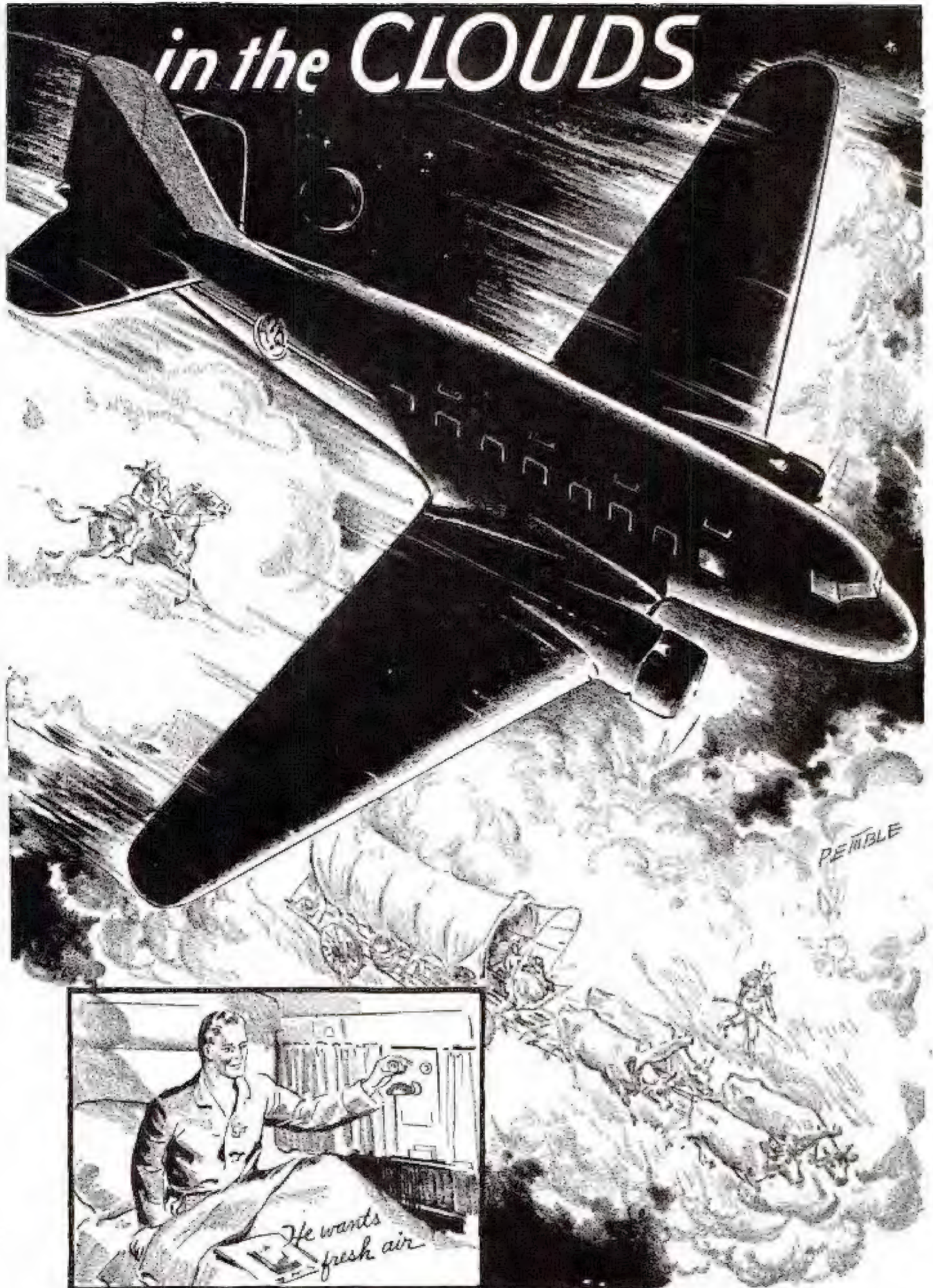
ASLEEP



High above the trail the stagecoach and pony express used to travel, a flying palace nightly wings its way from New York to Los Angeles. It's the "American Mercury," fourteen-passenger sleeper plane of American Airlines which crosses the continent from dusk to dawn—speeds you from ocean to ocean while you sleep. From the "sky room," a private drawing room up front, to the six semi-private sections in its spacious cabin, it is the height of luxury—and no pun intended. Riding a sleeper plane is a novel experience for most persons, and believing you might enjoy an overnight journey by proxy, we told one of our staff artists to make the trip and do a little sketching between naps. He

boarded the flying Pullman at Newark and before he was long in the air, saw the stewardess making up the "uppers" and "lowers" and tucking in her sleepy passengers. When he himself turned in, he found an individual ventilator and did his own air conditioning before falling asleep in the clouds

in the CLOUDS

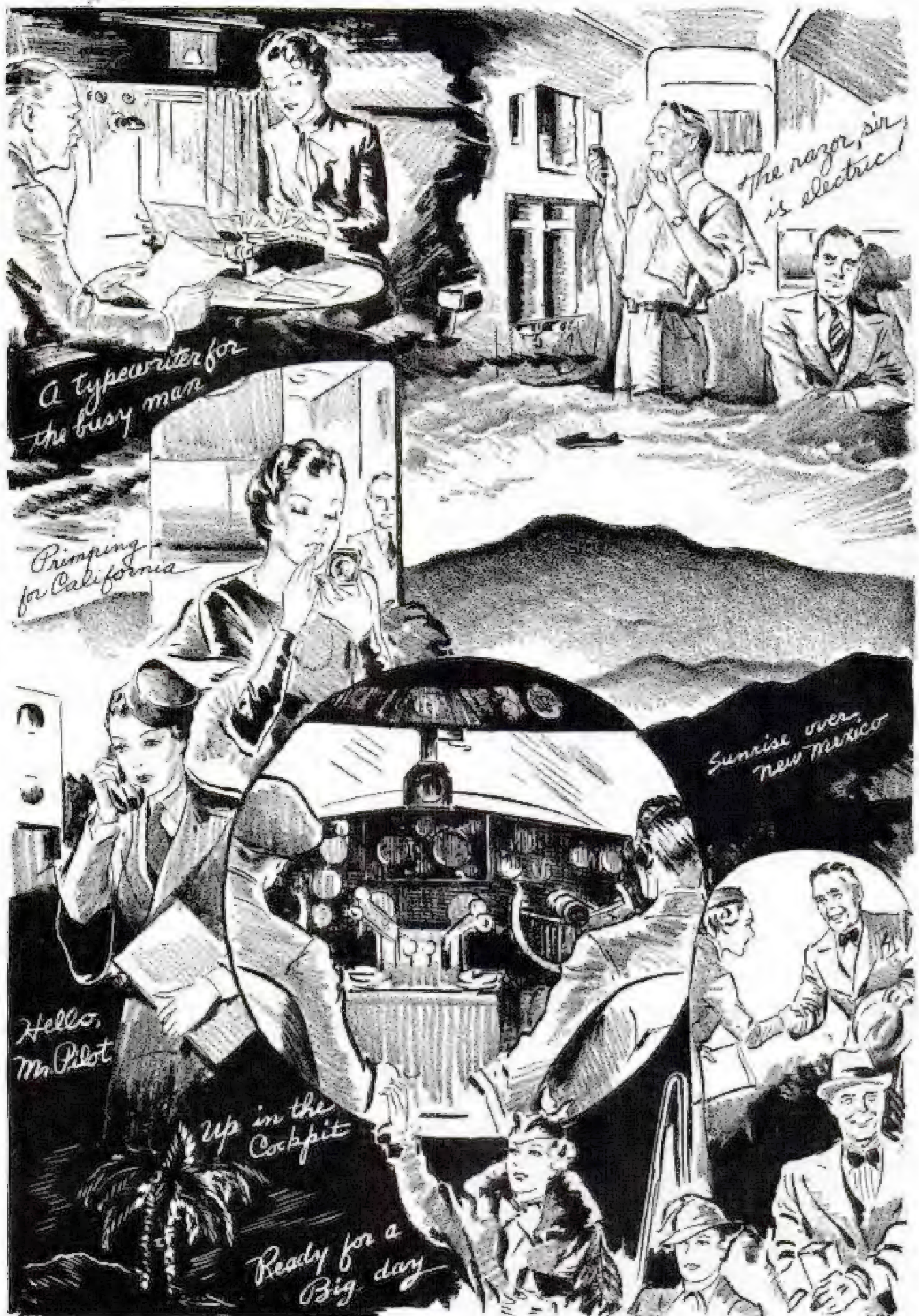




There's no "box lunch" on the flying sleeper. Instead it's a six-course chicken dinner served piping hot from the flying kitchen—and there's real china and silverware



This twelve-ton "Leviathan" of the skies boasts separate dressing rooms for men and women. You can read, smoke, sleep, eat, write letters, play cards or just view the scenery



Over her private telephone the stewardess hears the pilot announce you're nearing Glendale, and sixteen hours after leaving New York, you land in California

Masked Rescuers Sweep City After Gas Raid



Parisians carry out their peacetime war drills with grim reality. Here is a squad of rescue workers cleaning up gas-infested streets after a mock bombardment by "enemy" planes

Rescue crews held a "full-dress" rehearsal after a recent mock air raid on Paris by night. Wearing masks and gas-resistant suits, they went about the darkened city "mopping up" and disinfecting

the supposedly gas-drenched streets and effecting mimic rescues. During the practice attack all the lights in the city were extinguished except the eternal flame on the tomb of the unknown soldier.

Safety Swing for Playground Has Space for More Riders

Constructed so that it never rises more than three feet from the ground, a new safety swing for playground or school basement is on the market. It is hung on roller bearings, therefore is easily operated when loaded to capacity. One feature is that the swing will carry more children than the conventional rope or chain swing. The seat of the device moves horizontally through twenty-four feet of space, utilizing the body movement of a rowing machine in its operation.



Never rising more than three feet from the ground, this safety swing has space for about twelve children

Patent-Safety-Swing Co.

Patent-Safety-Swing Co.
New York, N.Y.

Metal 'Cop' for School Zone Removed When Classes End



Rear and front views of the sheet-metal "traffic cop" who stands in front of school during sessions and is stored away at end of day.

So realistic is the figure of a policeman standing in the middle of the street in front of a school that motorists apply the brakes before they are near enough to discover it is a sheet-metal "traffic cop." The figure is five feet six inches high, of sixteen or eighteen gauge sheet metal reinforced by a three-quarter inch pipe that extends through the base into a hole in the pavement five or six inches deep. When school is over for the day the safety sign is lifted out of the hole and stored away.

Cafe Walls Move Electrically to Vary Seating Capacity

Instead of hanging up the "Standing Room Only" sign when every table is taken, the proprietor of a San Francisco restaurant merely presses a button and presto! the walls move, and there is another dining room ready for patrons. With movable

walls he can accommodate his cafe to varying crowds. Each wall is operated by a one-fourth horsepower motor. Lowering one wall he can add a room seating 125 persons, and supplied by its own kitchen. Raising a wall he adds another room seating ninety, also with its own kitchen. Farther back is another disappearing wall that reveals a third room accommodating sixty more diners.

Rubber Bladed Fan for Auto Window Is Safe and Quiet

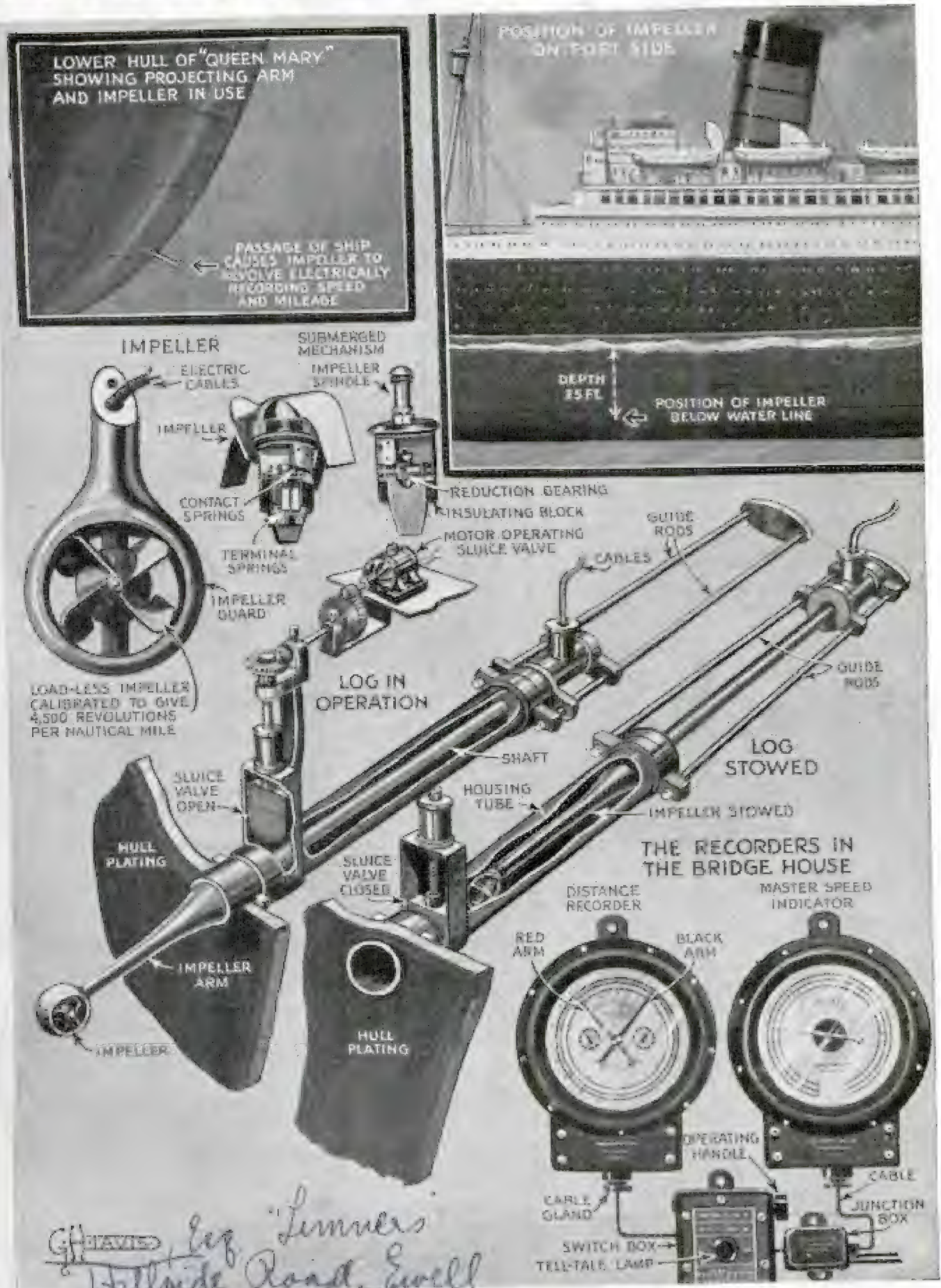
Blades of rubber make the windshield defroster fan safe and silent. A wire guard is unnecessary, for the blades would not injure a finger even if touched at top speed. The smooth, mauve finish of the rubber dissipates light and eliminates any eyestrain caused by reflections on ordinary metal blades. The six-volt fan operates on the automobile battery.



Flexible rubber blades on windshield fan cannot injure a finger, but they provide plenty of wind.

Chicago-Fields

Electric Log Records "Queen Mary's" Speed



Racing across the ocean or crawling in thick weather, an electric log tallies accurately "Queen Mary's" mileage and speed. A frictionless screw extended from the hull, calibrated for 4,500 revolutions per mile, makes and breaks electric contacts actuating dials which help the navigator chart his progress.

Cherrykeel & Co. Ltd.

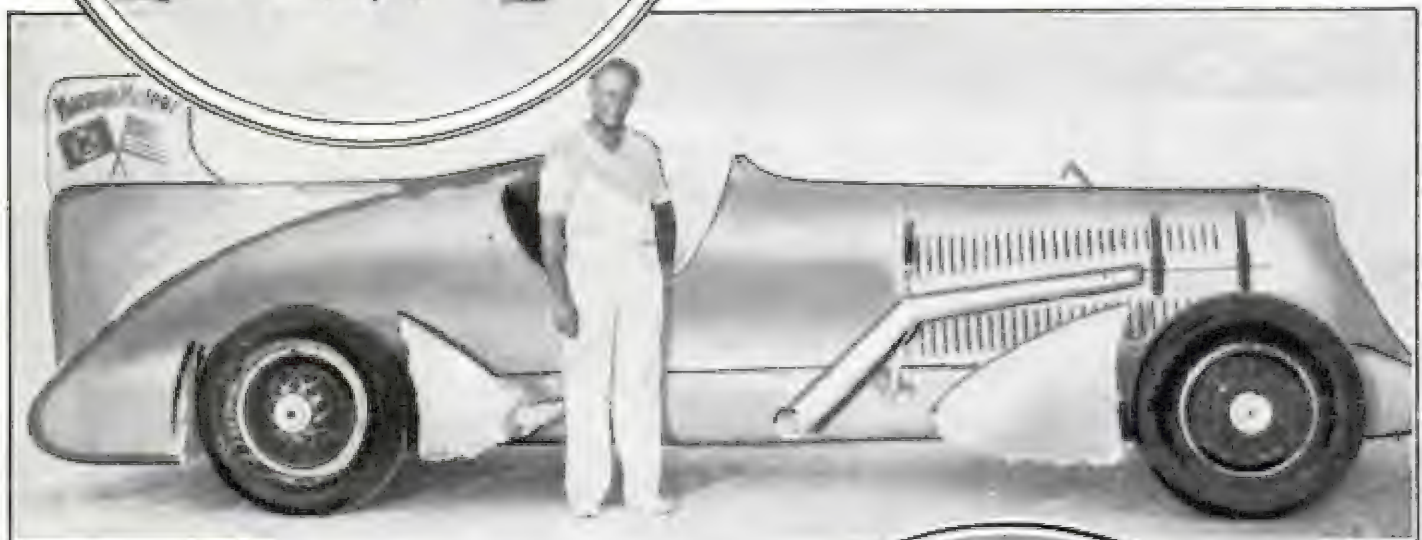
F1275 Mr. Leavitt R. Martin
Box 282, Ogden, Utah

Breaking SPEED RECORDS



John Cobb, have written automotive history in fast succession on the Utah Salt Flats during the past several months and the stories of their exploits are a climax to man's constant fight to conquer speed and mechanical limitations.

The speed laboratory of all motor-dom, the mecca of speed enthusiasts from every land, and the probable testing ground for motor-powered vehicles of the future, is located on the dry salt bottom of ancient Lake Bonneville, 125 miles west of Salt Lake City. This great level body of



EARLY seekers of automobile speed records were limited in their efforts to outdistance time by problems of motor, transmission and tires. Speed courses offered no serious problems because any open road or commercial racetrack answered the purpose.

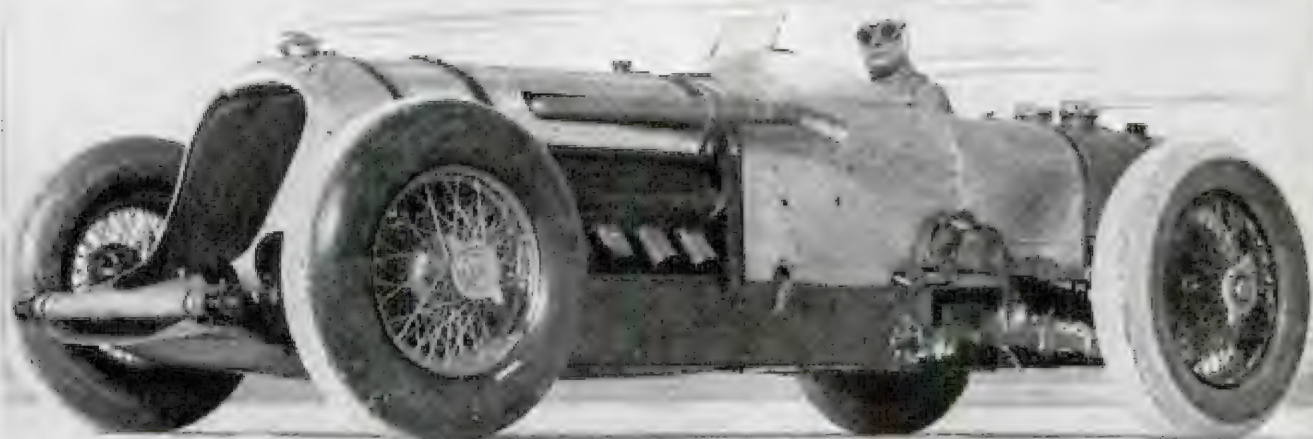
With the increase in recent years in motor refinements, the use of blowout-proof tires and streamlining, mechanical problems no longer present so many serious difficulties to the seeker of high-speed records. The problem now is to find a course which offers no physical limit to speed.

Four speed drivers have found a satisfactory answer. Ab Jenkins, American, and three British drivers, Sir Malcolm Campbell, Captain George Eyston and

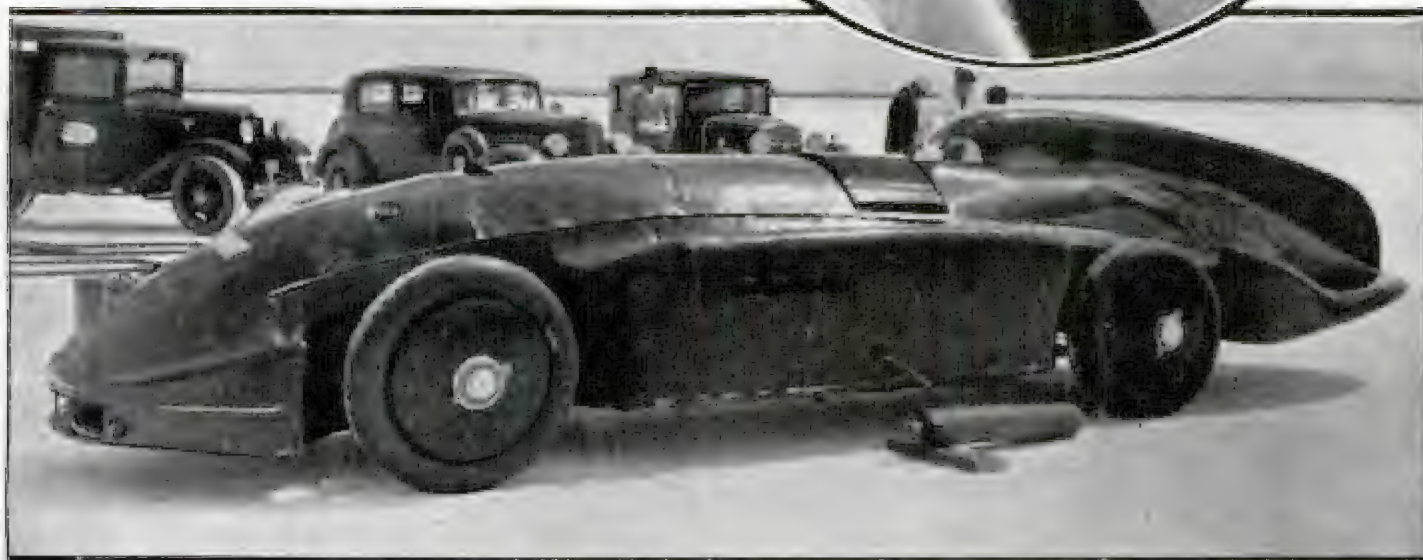


Top, trying to drive nails into the salt flats. Center, Ab Jenkins and his "Meteor." Bottom, streamlining cowling of "Meteor"

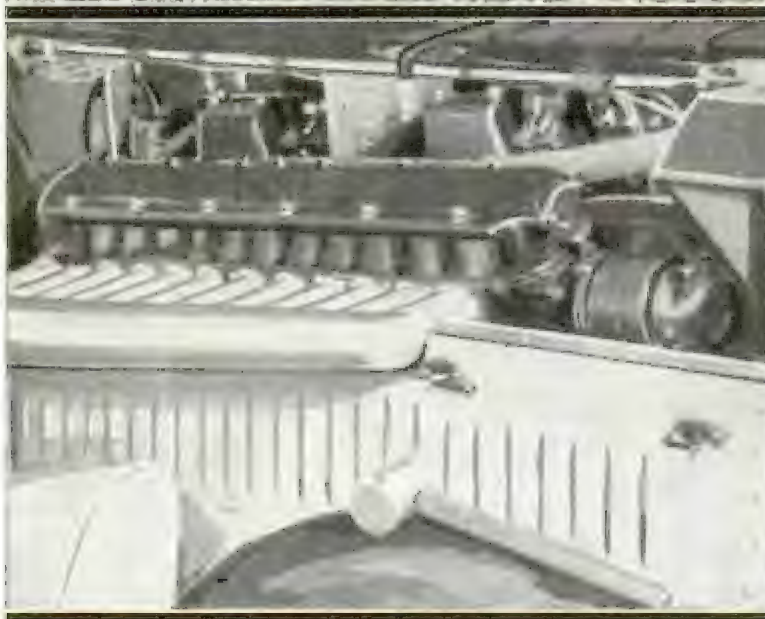
on the *SALT FLATS*



smooth, hard salt formed by the drying of the ancient lake is fifteen by thirty miles with an average depth of four feet. The salt flats are as white and dazzling under the noonday sun as new snow. The salt has the consistency of ice and is almost as hard as concrete. It crunches under tires like snow, is ninety-five per cent pure and needs only a slight treatment for human consumption. The flats accommodate many ten and twelve-mile circular speed courses and Sir Malcolm Campbell's 301-mile-an-hour straight-away was thirteen miles long.



Top, John Cobb, British driver, and his 600-horsepower speedster. In circle, broadcasting speed trial at the flats over a mobile short-wave transmitter. Bottom, the "Flying Spray," Diesel-powered car of Capt. George Eyston



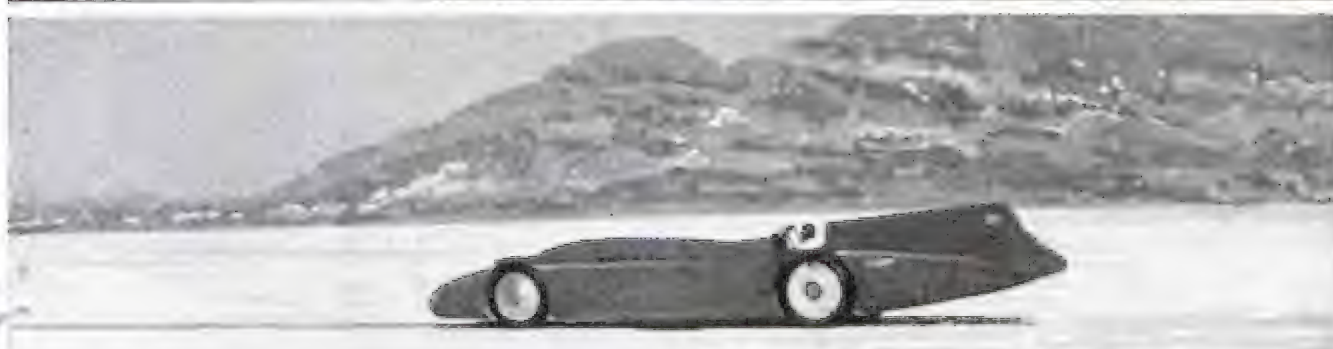
Top, timer watching speed trial. Center, sign near speedway. Bottom, twelve-cylinder motor of "Meteor"

America returned with a rush last September to world dominance in the realm of speed on land when Ab Jenkins roared to a new world's record of 153.76 miles per hour for twenty-four hours on the Bonneville Salt Flats in his \$40,000 twelve-cylinder "Mormon Meteor" powered with an airplane motor. Continuing on, Jenkins established a new world record for forty-eight hours of 148.626 miles per hour with a total distance covered of 7,134.08 miles. During his September runs, Jenkins established seventy-two new world records in all, including the one-hour speed of 170.99 miles per hour.

Thrills aplenty popped up during the speed tests. After running eighteen hours on a ten-mile circular track the great cream monster threw a tire while going 172 miles per hour, when the key pin in the rim lock broke.

"She's on fire," went up the shout from the pit camp, for the "Meteor" could be seen two miles distant with a great white smoke trailing behind her, salt dust thrown up by the wheel rim. The car limped into the pits at 100 miles an hour on the rim with

the right rear wheel streamline cowling smashed and trailing. This was torn away and nine minutes later the car thundered away. The same day, oil trouble developed and a fourteen-minute check disclosed the lock nut on the oil pipe into the oil reservoir all but off. It was loosened by the jarring when the wheel was thrown. During this stop it was discovered the driver had powder puffs on his ears under his helmet to help



keep out the noise. At two different times the driver lost control and the car skidded away in an 800-foot arc but remained upright.

At night the track was lighted by flares and the driver grew sick from the smoke. The car, capable of 200 miles an hour, required all the driver's attention as he had a continual fight with centrifugal force. So perfectly streamlined was the speedster that notes dropped by the driver as he passed the pit camp would drift to the ground directly at the point they were let loose.

Jenkins' car consists of a twenty-two-foot Duesenberg chassis powered with a salvaged Lycoming airplane motor. The car has a high tail fin and adjustable rudder as a stabilizer. The weight is 5,140 pounds with a 142-inch wheel base. It has a special transmission and the clutch locks at 100 miles an hour. The car has three speeds and an electric starter. The motor alone weighs 900 pounds and, with the transmission, 1,200 pounds. It develops 700 horsepower at 2,400 revolutions per minute with a speed of 180 miles per hour. It is a V-12, has two updraft carburetors,

(Continued to page 148A)

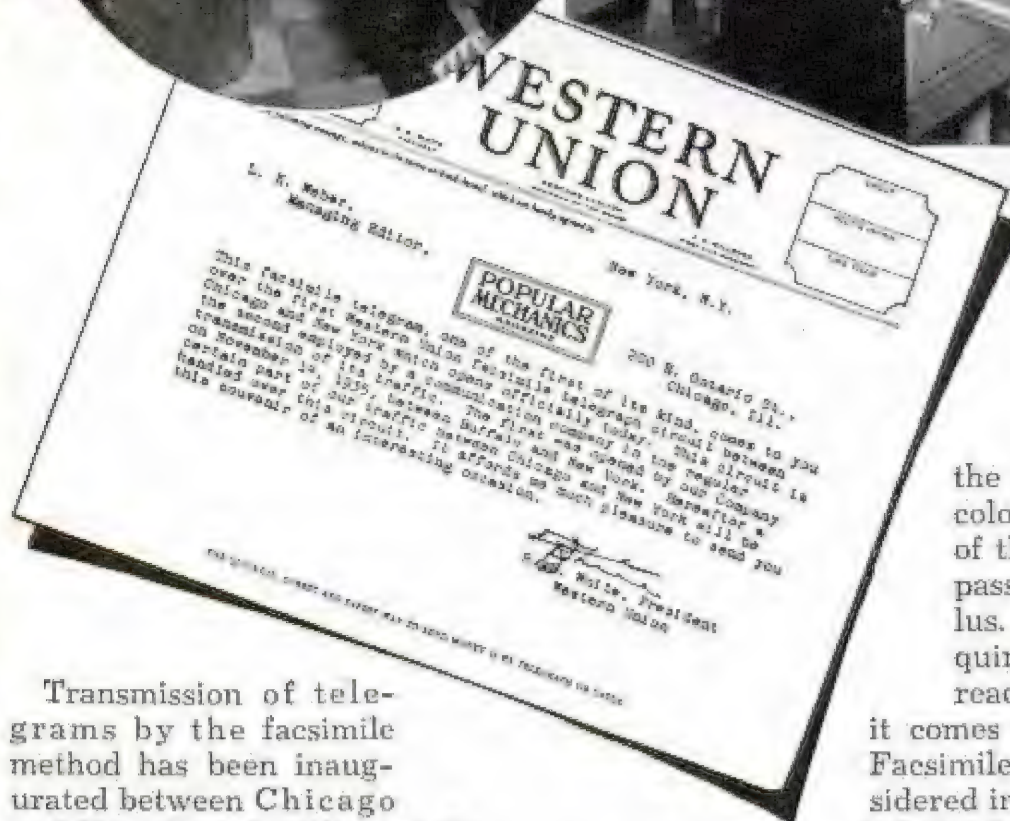


Top, "Meteor" making pit stop. Center, "Bluebird" traveling 300 miles an hour. Bottom, black line on salt to guide driver

Telegrams by Facsimile Latest Wire Service



Top, two views of the transmitting and receiving equipment for sending facsimile messages. Below, example of facsimile message, except that this appears on white instead of the special paper



Transmission of telegrams by the facsimile method has been inaugurated between Chicago and New York by Western Union. Telegrams to be sent in this manner are mounted upon a cylinder which revolves under an "electric eye." As the characters comprising the message pass beneath the beam, they reflect a greater or less amount of light. These gradations of light produce minute signals which are greatly amplified in telegraphic transmission to a machine at the other end of the line. At the receiving end is a machine equipped with a stylus which passes over the surface of a receiving blank mounted on a revolving cylinder. The impulses coming over the telegraph line cause an immediate color change in that portion of the paper in contact with the stylus. Thus is recorded the message,

the dry paper changing color under the influence of the electric current passing through the stylus. No processing is required, the message being ready for delivery when

it comes from the machine. Facsimile telegraphy was considered in the early days of the telegraph, but it was cumbersome and it was not until 1920 that Western Union had any part in actual facsimile operations and then in a limited way. In that year two Englishmen, H. G. Bartholomew and Capt. M. D. McFarlane, sent the first pictures ever transmitted across the ocean, using Western Union cables. Regular picture transmission service was established over Western Union cables between New York and London in 1925.

1924 - K. L. Miller

F1395

Orange-Lemon, Giant Mango Among Latest Fruits

United States patents have been issued for more than 200 fruits, vegetables and

Conf. C. van Housen

flowers in the last two years, including a combination of the orange and lemon, a giant mango which can be shipped successfully, a white raspberry without thorns, an early variety of the York imperial apple and an improved freestone peach. The orange-lemon is described as a sort of citrus fruit shaped like a lemon, colored like an orange and tasting like both. Until recently the mango could not be placed on northern markets, due to the rapidity with which it deteriorated, but a horticulturist at Naples, Fla., has developed a variety resistant to decay which may be shipped. Its size, formerly that of a pear, has been increased to almost a foot in length and more than seven inches in diameter. In addition, it has a bearing period of three months, the first crop being harvested the middle of May. The improved York apple matures two to three weeks earlier than its parent, while the new freestone peach tree produces only marketable grade-A fruit.

Hurricane-Hunting Radio Set Hung to Balloon by Its Aerial



Wire by which weather instruments and radio transmitter are suspended from balloon acts as antenna for the radio set

Air Rudder Helps Pilot Steer 150-Mile-an-Hour Boat

Candidate for the title of "world's fastest boat" of unlimited class is the "Miami Queen," a power boat equipped with an air rudder to facilitate steering at high speeds. Twin twelve-cylinder motors drive this racer with belts instead of the usual water-cooled gear box.



Designer expects this boat to develop 150-mile-an-hour speed

Robot weather reporters trail hurricanes right to the stratosphere and send back news of temperature, humidity and atmosphere pressure in the heart of the storm zone. These reporters are tiny radio transmitters and observation instruments, harnessed to balloons that will carry them as high as fifteen miles above the earth. The radio set is hung to the balloon on a wire that also serves as antenna. The meteorological staff of Massachusetts Institute of Technology plans to study weather in the hurricane belt of the Caribbean region and the southern states by releasing these weather balloons in the path of the storms.

Ⓐ mountain-top airport is being built on Mt. Palomar, Calif., so astronomers may fly to and from their work.

F1322

Designed by Louis
Santo, Miami, Fla.

above

Louis Santo, 1911

California
Institute of

united states
Cambridge, Mass.

Twin Diesels Drive Submarine in Proving-Ground Tests



This odd-angle photograph makes submarine appear as large as an ocean liner

Propelled by twin Diesel engines, the latest submarine in the U. S. navy has been undergoing proving-ground tests off Provincetown, Mass. Known as the P-5, the underwater craft is 306 feet long, displaces 1,300 tons and is armed with a six-inch gun and the usual torpedo tubes.

The Lower the Temperature the Thinner the Ice

Ice grows thicker and quicker at zero than at severe sub-zero temperatures. This paradox has long been recognized by sailors, but science now has an explanation for it. Dr. W. J. Humphreys of the U. S. Weather Bureau points out that ice grows fastest when its upper surface is coldest, and the surface temperature varies according to weather above. If snow covers the ice, or foggy air insulates it, the escape of heat from the underside or

growing surface of the ice is retarded and it thickens slowly. Usually in zero weather there is little fog, and sufficient wind to blow the ice clear of snow and thus promote rapid freezing. In sub-zero weather "frost smoke" drifting from the deep water often spreads over the surface, acting as an insulator and sometimes depositing fine snow which retards ice formation.

Aluminum Salt-Pepper Shakers Have "S" or "P" in Top

Made of heavy-gauge aluminum with spun-ray finish, the latest salt and pepper shakers have "S" or "P" punched in the top. The shakers have Bakelite bases, and are inexpensive, but distinctive enough to match fine table appointments.



Metal Sled Built Like Plane Lightens Dogs' Load

Constructed on the same principle as the modern airplane, the latest dog sled is made of duralumin, reducing the weight to sixty pounds, compared to 120 pounds for the old type. The runners are shod with very hard, thin stainless steel. The new freight sled is as light as a passenger sled, yet withstands loads of a ton or more.



Tubing framework of latest sled. Weight has been reduced fifty per cent

Expert Workers Chip Ribs of Giant Mirror

Just a fraction of an inch at a time, skilled glass workers are chipping the reverse side of the giant 200-inch mirror being prepared for high-power telescopic observation of the heavens. The workers are removing the heavy ribs which were left on the mirror so that it could be handled safely in shipping to California Institute of Technology for final preparation. The job of removing the ribs is entrusted only to experts. The mirror will be installed in an observatory atop Palomar mountain near San Diego.



Experts at their job of cutting away the heavy ribs from the giant mirror which will be installed in observatory

Plywood Figure Directs Tourists to Camp

Made from plywood and painted in gay colors, the figure of a happy-looking old man directs tourists to a Minnesota camp. The figure is constructed with wooden thumb jauntily inviting the motorist to turn into the grounds.



This jovial figure isn't thumbing a ride; it's directing tourists to campground

House Gutters Kept Ice-Free by Chemical "Hot Brick"

Packed in cartons complete with fasteners for slate or shingle roofs, a special chemical for preventing water from freezing in the gutters and downspouts of the house is on the market. The chemical compound, called "hot brick," is held in a porous container and is fitted with a wick. When the container becomes wet, a continuous flow of non-freezing fluid is delivered through the wick. When the wick becomes dry, the flow stops automatically. The compound is designed to last one winter. Its function is to prevent freezing, thus forcing the water to leave the building as a liquid and without the damage frequently caused by ice-clogged gutters.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

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Bureau of Information

Chicago Daily News
Chicago Daily News

ENGINEER Casey Jones



the terminal yards in Chicago and swinging gracefully around the curve onto the main line toward the west.

When the "City of Denver" "takes off," either from Chicago or on the eastward trip from Denver, it is still an "event." It is like the sailing of an ocean liner, although there is little swank about it on the railroad's part. The real excitement of the trip is in what is still called the engine "cab," although it is more like the front platform of a modern street car. So let's get back with George and take a ride.

Take a look first at the cab itself. Did you ever

By William H. Foer

YOU are sitting behind George Reid, skipper of the "City of Denver," who is waiting for the starting signal from Frank Greenway, the conductor of this amazing streamliner. It comes as a single sharp-toned note from an overhead valve.

George's face, weatherbeaten by sun and rain and wind through the forty-odd years spent leaning out of steam-cab windows, breaks into a grin. He grasps the throttle bar with both hands and slowly eases it toward him a notch or two. Behind, from the door leading to the engine powerhouse, the Diesels, which until then have sounded much like a huge idling automobile engine, roar into a steady, powerful whine like a buzz saw in a logging mill. The "City of Denver" is on its way, rolling down the maze of tracks through



Dispatcher listening to progress report of "City of Denver" and conductor giving "high ball"

TURNS MOTORMAN

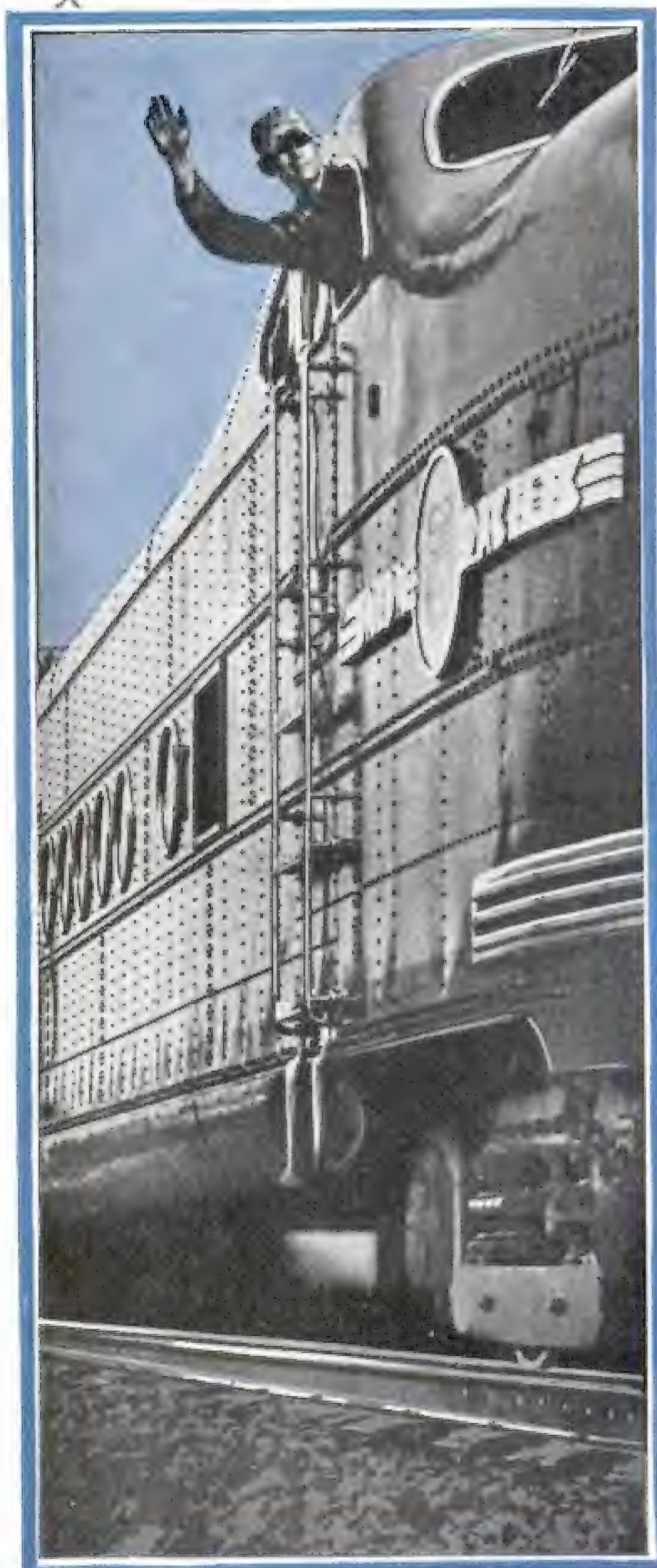


see the inside of the control section of a steam engine? Ahead, a boiler with its yawning firepot door blazing with a roaring flame whenever it is opened, with gauges showing the temperature of the water, the mount of steam pressure. Behind, with no room to spare, the coal chute, a huge scoop shovel along with firepot implements, coal dust on the iron floor. On each side a high, uncomfortable seat, one for the fireman and one for his engineer. Craning half out the cab window is the only way anything like a clear view of the road ahead can be obtained. Boiling hot in the summer, cold in the winter and slopping wet during a storm.

In the "City of Denver" a rounded window of safety glass—the whole train is equipped with it—gives an unobstructed view both straight ahead and to each side. The prow of the train extends forward from the "windshield" like the hood of an



Power plant of the "City of Denver" and engineer at controls of this modern streamliner



Easing the streamliner through the Chicago yards preparatory to making its run to Denver. Old-time engineers are divided in their opinions about these modern trains. Some of them object to being converted into "street-car motormen" but applications to drive the new trains outnumber the available jobs

automobile. Behind this windshield are three leather-upholstered seats, one for the engineer, the other two for his assistant and whoever else may be there. The engineer's chair is deeply cushioned, with arms, and is set on a swivel. The only difference, so far as comfort is concerned, between it and the private chair of the president of the railroad is that it can't roll across the floor. The windows roll down like those of an automobile. There is plenty of leg room in front of the seats. In front of the engineer on the dashboard are six gauges or indicators. One indicates the speed, another shows the heat of the engine and the others indicate air pressure of the brakes. To the left of these are three round disks of ground glass, set in a row and shaded by separate metal visors.

These, Claude Lewis, foreman of engines for the North Western explains, represent the most important development in railroad-ing during recent years. They are the silent watchmen of the railroad's automatic train control system. If the track is all clear ahead, a green light shows in one of them. If there is some obstruction, the green disappears and two smaller spheres, red over orange, appear. At the same time a whistle blows, in case the engineer might have his eye on something else. When that red-and-orange signal appears—and with it the sound of the whistle—the engineer has exactly ten seconds to apply forty-five pounds of air on his brakes. If he should fail to do this, automatically the emergency brakes would be thrown on and the train brought to a stop.

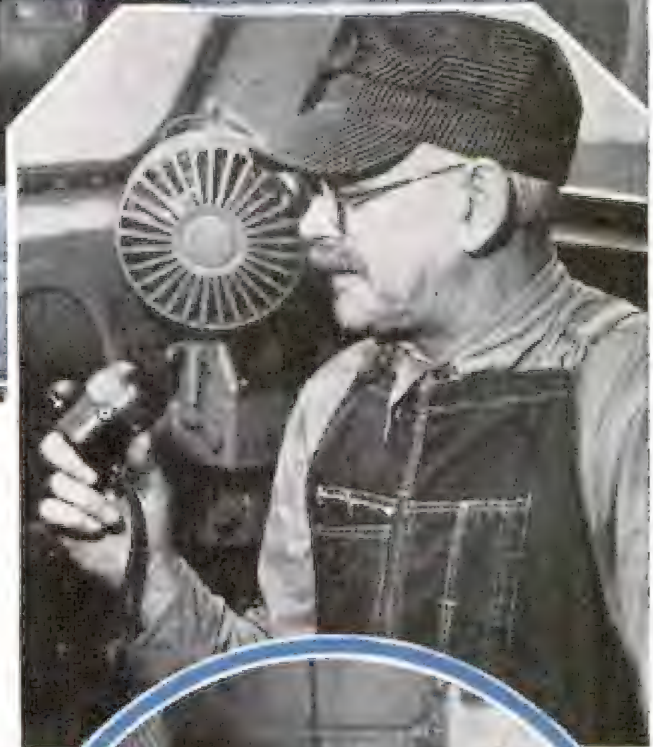
As the engineer sits in his chair, his right foot rests continuously on a pedal, the springs of which are so delicately adjusted that only the weight of his foot is necessary to hold it down. Railroad men call it the "dead man's foot." If, inadvertently, the engineer



should move his right foot, the train would immediately come to a stop. This, it was explained, is to avert the possibility of an accident if the engineer is suddenly stricken with a heart attack or for some reason should be thrown from the control seat. Instead of careening down the tracks with no one at the controls, the train would stop itself. At the left of the engineer is an adjustable lever like the emergency brake on an automobile. This regulates the shutters on the outer hood which form part of the cooling system. The engines are water cooled with air vents to cool the water system. Watching the temperature gauge, the engineer regulates the heat of the engine by opening or closing the shutters. There is even a loudspeaker through which the train crew can talk to the engine from five different points on the train, should anything go wrong. A miniature "mike" in a niche on top of the control box enables the engineer and the train crew to hold a two-way conversation.

It is dusk as the train pulls out. Clouds scudding overhead reflect flashes of crim-

(Continued to page 128A)



Engineer at controls of the "City of Denver." Center, engineer conversing with train crew by "telephone." Bottom, the "dead man's" throttle which stops train if pressure of foot is released

7 150 1



In this vast amphitheater thousands will gather during the New York world's fair in 1939 to witness water sports and pageants, fireworks, concerts and operas on an island stage 100 feet from the lagoon shore. Beneath the stadium the architect plans a great promenade hall flanked by exhibition rooms

Leaning Towers Start Power Line from Dam

Modern versions of the ancient "Leaning Tower of Pisa" are the rigid steel transmission towers that overhang Boulder canyon. They are the first of a chain of towers that carry the 266-mile line of hollow copper cables bringing electric power across desert and mountain from Boulder dam to Los Angeles and other cities of the Southern California coast.



These leaning towers of steel perched over the brink of Boulder canyon shoulder the cables that start power flowing from dam to metropolis

Siphon to Handle Billion Gallons Each Day

Spanning California for 390 miles a giant aqueduct which will supply thirteen cities, including Los Angeles, with water is under construction. It will carry water from the Colorado river. Included in the great system is a huge siphon made of steel bars and concrete. It is large enough to handle one billion gallons of water per day.



Figure of the girl helps to illustrate the size of iron-ribbed core of siphon which handles billion gallons of water per day

Steam Turbine Rail Locomotive Powered Like Ocean Liner

With virtually the same power plant that drives an ocean liner, a steam-turbine locomotive will make its debut this year on the Union Pacific railroad. From the

traditional steam engine the railroads have turned to electric locomotives, gasoline motor cars, Diesel-electric power cars and now the steam turbine drive, in which steam is employed to turn the generators furnishing power to the driving motors. Lighter than the Diesel locomotive of corresponding power, this Union Pacific driver will be able to haul a 1,000-ton train at 110 miles an hour. It is expected to be more efficient than conventional steam engines.

There are more than 190,000 miles of streets in American cities of 2,500 or more population.

Wide World
marjory Isage

American City
Oct. 1906

Wartime Gas Attack Refuge Has Radio, Food and Water



Self-sufficient chamber built by London concern to shelter employees during gas attack. It has oxygen, food and water

Forehanded London firms are planning protection for their employees from the threat of gas attacks on the city in the event of another outbreak of war. One company has installed a self-sustaining refuge which is proof against every known form of deadly gas and has not only air filters but first-aid equipment, food lockers and a water supply. Thus its occupants could withstand a prolonged gas attack. The shelter has telephone and radio for communication with the outside world.

Craftsmen of Old in Crew of Modern Liners

Modern ocean liners, like the giant "Queen Mary," carry in their crew such craftsmen of ancient days as a lamptrimmer and a sailmaker. The lamptrimmer's job on the windjammers of old was to keep wicks trimmed and lamps filled with oil. On the modern liner he performs the same duties because all ships are required to carry a set of oil navigating lamps to sup-

plement the electric lamps. The sailmaker, now that sails are not used on big liners, fashions canvas covers for lifeboats, ventilators and hatches. He is now called the storekeeper and is responsible for seamen's stores, such as rope, paint, wire and canvas. The ship's carpenter deserves the name of shipwright because he is an expert worker in metal and wood. Any major repairs that are necessary while the ship is at sea are handled by the carpenter and he also transfers the water ballast and water supply from tank to tank to keep the ship "trimmed" and pumps in water ballast to replace the oil as it is consumed by the engines. The "Queen Mary" also has her ordinary seamen, who find plenty to do keeping decks scrubbed, metal polished, hatches battened down and a thousand and one other tasks. Also in the crew are electricians, plumbers, engineers, boilermakers, joiners, stewards, bellhops and even policemen, called masters-at-arms.

Overnight Tent on Top of Auto Is Tourists' "Upper Berth"



Tourists camping for the night on top of their car. Tent is supported by ladder-like prop in front

Ten minutes after you have parked the car in an ideal camping spot you can have the tent pitched for the night on the roof. This "upper berth" for campers was in-

Cuyard while gas

Office of Carriage Engineering & Coachbuilding Ltd.

Levine
Levellers
71, Venice
One side, 20, Santa Sabina

Ad information

their own areas. . . . Only
loved what he did. The
Lawrence managed to
cause after



... we must control or reconcile. We have tried it, with
ing results, in Ireland, in India, and in South Africa.
we are faced with a similar problem in Palestine.
of my books this week touch on this question, from
cent points of view. Some of them also allude incident-
to Lawrence of Arabia, of whom we were reminded
n recently by Mr. Churchill's masterly address when
elling a memorial tablet to him at the High School, Oxford.

t must not be thought that these matters constitute
whole interest of "THREE DESERTS." By C. S. Jarvis.
Governor of Sinai. Illustrated by Frank Lee (Murray ;
6d.), a work recommended by the Book Society. The
or has had eighteen years' experience as an adminis-
er of Arab countries, including thirteen in Sinai as
ernor. He therefore writes with authority concerning
Arabs, but his book has not the slightest trace of
ial *hauteur*. It is, in fact, a delightfully entertaining
ount of his personal activities and journeyings, per-
ated through and through with wit and humour. At
same time, it possesses a solid core of historical value
a picture of people and places and a record of events.
"three deserts" are those in which his administrative
er was successively located—in Libya; the region
ounding the Kharga oasis; and the wilderness of Sinai,
of the most curious episodes is the great campaign
nst locusts. Very interesting, too, are the passages
ribing how, as gardener and agriculturist, Major Jarvis
e the desert to blossom like the rose. Perhaps the
t charming part of the book, however, is that devoted
his canine friends. In its humour and sympathy it is
of the best things about dogs that I have ever read.

Major Jarvis heads his chapter on Lawrence and the
b Revolt with Antony's tribute to Brutus: "And say
ll the world, 'this was a man.'" Mr. Churchill recalled
vrence's distress at "what he deemed the ill-usage of
Arab friends and allies," to whom he had pledged the
d of Britain and his own. Major Jarvis apparently
siders that the Arabs were unworthy of Lawrence's
olon. "There is no questioning the fact," he writes,
at Lawrence was a great man and that he will go down
posterity as the finest guerrilla commander that has
r existed. . . . The Arabs were only interested in the
olution for three objects, in the following order of
ortance—gold, loot and the satisfaction of *the race*.

... of

"The Jews," says Lord Melchett, "do not wish the land
that was allotted them as a National Home to become a
perpetual battle-ground. They definitely do wish to live
in peace and goodwill with the Arab community." Here
and elsewhere the author seems to suggest that the whole
of Palestine is to be the Jews' National Home. This goes
rather beyond the words of the Balfour Declaration, which



SACRILEGE IN THE SPA-
THE CHILD CHRIST DRE-
MENT MILITIAMAN AND

ENISH CIVIL WAR: A STATUE OF
SSED TO REPRESENT A GOVERN-
GIVEN A REVOLVER AND A RED

to eke out a meagre existence, is so much more
The standard of life of the Palestinian Arab
the highest among the native population of the
East. This is a reversal of the pre-war condition
Palestine was the most backward State of all. No
tion is placed on the immigration of Arabs from
and Transjordan, and their large influx is at once
the greater attractiveness of life in Palestine as
refutation of the claim that Arabs are being forced
the country. It is estimated that since 1922 no less
200,000 Arabs have immigrated into Palestine.
There was a time when Europe was plunged in the
Ages, and when the torch of culture and knowledge
kept alight only by the harmonious co-operation
and Arab. Why should not this erstwhile trust and
ship be restored? The two peoples together could do
things for the world. Why shall not Israel and
live once more in amity in the field as in the town
Jerusalem shall once more become the 'city of
and 'be full of boys and girls playing in the
thereof'? (Zechariah viii. 5.)

Another expression of the Zionist standpoint
from an American Jewess who has gone to live in Pal-
She relates her experiences with fervour, and picture
(sometimes unpleasant) detail, in "SPRING UP, O V-
By Dorothy Ruth Kahn. Illustrated. With an
duction by Henry W. Nevins (Cape; 10s. 6d.).
author strikes a hopeful note when she says: "For
Arab and the Jew it may be only a matter of time
these two Semitic mentalities are able to re-orientate
selves to each other." The fact that Mr. Nevins
considered this book worthy of commendation will
less win for it many readers. His own early inter-
Jewish history, he recalls, sprang from a Victorian re-
education, laying stress on Old Testament stories
tending to make British children identify themselves
the Chosen People. "How much greater that in-
must be," he proceeds, "to every Jew who appreci-
Palestine for the first time. Mr. Balfour's Declaration
1917 has made the phrase 'National Home' familiar
for a Jew Palestine is far more than a National Home.
It is a 'Spiritual Home.' Ever since the Roman leg-
destroyed his city and laid waste the heritage of his
the heart of the Jew has turned to his spiritual home
Christians have turned to the site of Calvary, and Me-
to Mecca. The author of the present book shows
irresistible is the attraction, even to a Jew who was
reared in the Jewish faith or custom."

two years of close
in their failings and weaknesses and their total lack
of feeling were daily brought home to him."

Again, Major Jarvis suggests that the Arabs, after all,
are a little cause for complaint. "I cannot see, considering
things," he writes, "that we failed
honour our bond to any great extent.
Iraqians, who took no part in the
have their independence, and the
djaz or Saudi Arabia has it also.
us-Jordan has a very modified form
British Mandate which practically
counts to independence.... The great
of the Syrian people did absolutely
thing beyond hold secret meetings
talk. The inhabitants of Palestine
rather less than this, and yet it is
in the educated *effendiya* of the Syrian
Palestinian towns that one hears all
talk of Arab independence and Great
Britain's perfidy. In the first place
these people took no part whatsoever
assisting the Allies to drive out the
ark from their country, and secondly
they are not Arabs. An Arab must of
necessity be of Arabian birth, and neither
Syria nor Syria is in Arabia proper.
th these countries are inhabited by
ace of cultivators and townfolk who
undoubtedly descended from the
ancient Syrians, Jebusites, Canaanites,
Philistines or others that occupied these
lands before the days of Christ. True,
they were conquered by the Arabs of
Arabia in the seventh century, but that
does not make the inhabitant of the
country to-day an Arab any more than
the conquest of Great Britain in A.D. 43
makes the Englishman an Italian."

As in all international questions,
a general reader, unacquainted with
locality concerned, is bewildered by
conflicting opinion among those who
possess that special knowledge. I re-
member, for example, a recent article in
Observer by Professor John Garstang,
in which he contended that the Balfour
Declaration, favouring the "establishment in Palestine
a National Home for the Jewish people," and the subse-
quent British Mandate, practically ignored the fact that the
country was "already the home of another people," and
that "for more than 1000 years an Arab people has dwelt
at

This photograph, which, a correspondent states, was taken
the road to Cordoba, shows a statue of the Child Christ taken
out of a church and placed as a warning to drivers entering the
village of Ballen to stop and have their papers examined.



AN ORGY OF WANTON DESTRUCTION BY "RED" PARTISANS AT VICH, A TOWN NEAR BARCELONA:
A PILE OF ECCLESIASTICAL STATUES AND TREASURES TORN FROM THE BISHOP'S PALACE READY
TO BE BURNED IN THE MARKET PLACE.

According to a description sent with this photograph, not only were paintings and sculptures destroyed on this
occasion, but archives containing documents of historical and archaeological value of the fourteenth, fifteenth,
and sixteenth centuries and a collection of old Mass books were burnt. Certainly the Museo Episcopal in the
Bishop's palace contained a number of artistic treasures. Whether these have all perished is not known.
Photographs of church-wrecking in Andalusia are on the opposite page.

proposed establishing such a home "in Palestine." There
is a slight distinction between the two ways of putting it.

Lord Melchett traces the history of Zionism and offers
practical suggestions for a settlement. Among other
things he suggests that the future of the Arabs should be
to develop the vast territories of Arabia, and, discussing

though not so military, are related in "THE BLACK
OF ARABIA" (My Life Among the Bedouins). By
Raswan. Illustrated (Hurst and
Co.; 3s. 6d.). This is a new
to the Paternoster Library,
apparently from an earlier
The book drew high praise
late Mr. Cunningham Graham
said: "It sets before you the
Arab life and point of view
as something seen in a
lightning." The author is
who had already spent the
among the Arabs when the
He then served at the Dardanelles
and on the Suez Canal.
war he eventually returned to
He expresses deep admiration
Lawrence, and of the late
Doughty's classic "Arabia
His own purpose in revisiting
was mainly to study the Arab
and its breeding. His book
valuable information on the

The author attributes his
with the Arabs, and their tri-
to the fact that he refrained
meddling in their politics
appendix, however, he provides
esting commentary on political
in Arabia and on the genius
Ibn Sa'ud. "Perhaps Great
he concludes, "is destined
god-father to this new
Islamism. Great Britain must
upon by the world of Islam
same rôle of protector and co-
she has done, and will do
federation of Indian States, a
further be called upon to de-
of securing everlasting and
peace between both the
Abraham—Israel and Ishmael. This would end
Arab question. In my opinion, it can only come
stands for an Arab Empire as it stands for an Indian
and embraces within this Arab-Indian Empire
State, as a stout ally of all Arab States." Sur-
is justified of his saying—"What should the
England who only England know?"



GAS-MASK PRINCIPLE APPLIED TO A SHELTER: AN UNDERGROUND ROOM BENEATH A GASPROOF OFFICE WHICH IS SO DEvised THAT IT COULD RECEIVE ONLY PURIFIED AIR DURING A GAS ATTACK, THUS ENABLING THOSE WITHIN IT TO REMAIN IN SAFETY.

anti-gas shelter, built underground, has been installed at the offices of the Engineering Co., in Buckingham Gate. It has alternative entrances, each of two doors forming an air-lock. Thus people can be admitted without any known form of gas, and then discharges the purified air through any known form of gas, and then discharges the purified air through into the interior. Should the inlet be destroyed, a valve inside the can be closed, shutting off the outside supply. A continual circulation through a chemical CO₂ absorber then takes place, while oxygen is from bottles in order to maintain the air at the proper oxygen level. The fan used for drawing the air from outside, or circulating air inside,

the shelter is driven by an electric motor; but, should the power supply fail, the fan can be operated by means of a pedal attachment. The walls are treated with a special coating in order that the shelter may be as air-tight as possible. The equipment is very extensive—including a wireless set, so that bulletins can be received, a telephone, first-aid necessities, gas-masks, food lockers, and drinking water. The four-storey building above has been fitted with gas-filtration plant so that the staff can remain at work during a gas raid. This plant takes the air from outside through a poison-gas filter and discharges it into the various rooms in pure form by ducts normally used for conveying air from an air-conditioning plant. Steel shutters are fitted to the windows for protection against bomb splinters and flying debris.

Illustrated London News Oct. 18, 1930

roduced to motorists in France. The overnight tent, compactly packed on the top during the day, is quickly unfolded, and is entered from the front by a ladder which serves also as a frame for the tent floor. The flap has zipper fasteners.

Coffee Measured by Dial on Glass Jar

Helping to maintain uniform strength in coffee, a measuring dial attached to a glass coffee jar permits only the exact number of spoonfuls to be dropped into the pot. The dial has three letters, "L," "M" and "S." Manipulation of the dial at "L" produces a perfectly measured large spoonful of ground coffee; "M" a medium and "S" a small spoonful. Thus is eliminated all guesswork. Coffee in the jar remains fresh.



Measuring coffee into the pot with aid of device on latest glass container

Tire Chain for Dual Wheels Has Easily Detached Lugs



Notice the broad lugs attached by a single chain to dual tires. A truck equipped with these successfully navigated the sticky mire at right

Detachable lugs made to fit the dual wheels of motor trucks assure good traction whether on icy pavements or in hub-deep mire. A single chain between the tires holds the tough, long-wearing lugs in place, and they can be installed without jacking up the vehicle even if the wheels are axle-deep in gumbo or sand. The lugs are made of drop forgings, heat treated and case hardened, and the chains are of heavy steel, electric-welded links.

Rat's Leg Grafted to Another without Loss of Function

Without loss of muscle or nerves, a rat's leg has been transplanted to another rat. The grafted leg not only remained healthy but its new owner can control the muscles and flex the toes. Dr. J. V. Schwind of Chicago accomplished this by transplanting the right hind leg of a white rat, including all bones and muscles below the knee, to the back of a second rat, giving it five legs. The sciatic nerve of the leg was joined to a branch of the rat's sciatic nerve so that when its own right hind leg moves, the transplanted leg also moves. Until satisfactory blood vessel connections were made, the leg was left partly attached to its original owner.

Dr. Williams' Wonderful
Tropicure, 60-11th Ave. Minneapolis, Minn.
School of Medicine, Loyola Univ.

Dr. Williams' Wonderful
M. K. Pfeiffer

GIANT BOMBERS



bombers are considered ideal for defense against any enemy air attack which might be launched against Gotham, the treasure house of the United States.

The defensive work of the bombardment planes would be in the form of a fierce attack on the enemy air bases, which probably would be the decks of airplane carriers. Guided to their objective by the radio of a naval vessel or the buzzing antennas of scouting planes, these bombers could carry enough T.N.T. to put out of commission any airplane carrier now afloat.

Each of these planes can carry



FROM dawn to dusk, giant planes waddle from hangars at Mitchell Field, Long Island, these days as pilots, machine gunners and bombers learn to manipulate Uncle Sam's latest birds of death, monster bombardment ships intended to protect New York City's millions from enemy air attack.

Thirty of these flying death-machines, B10b Martin bombers, each capable of carrying a ton of bombs, have been delivered as a part of the new plan of the General Headquarters Air Force to convert the former observation unit into the most deadly bombardment group on American soil. Capable of a cruising speed of more than 210 miles an hour, these long-range

All photos by Harris and Ewing
Loading bomb into Martin bomber, and machine gunner demonstrating mobility of his weapon

350 Madison Ave N.Y.C.
a ton of destruction ranging from 100-pound demolition bombs to 2,500-pound high-explosive bombs, one of which would wreck a shipyard, freight terminal or a fair-sized city. In defensive action, perhaps, some of the planes would carry smoke bombs, to help our fleet screen its defensive maneuvers. Other bombardment planes would carry bombs heavy enough to disable or destroy a battleship, and still

Guard NATION'S Gates

Weighing ingredients going into aerial bomb. Below, the "egg sack" of a bomber open and the demolition bombs beginning their earthward flight. Bottom, inserting chemical into smoke bomb



others would carry 100-pound demolition bombs. Direct hits from three of these would create such havoc on the flying deck of any enemy carrier that it would be unfit as a base for many days.

But it is not with their bombs alone that these flying fortresses would prove invaluable defenders of America's greatest city. Taking off without a burdensome load of bombs, these planes have a straightaway flying speed as high as any planes likely to attempt the bombardment of New York City. Spread fanwise over the ocean, their chattering machine guns could make a formidable ring of death through which an enemy would have to fly before



"laying eggs" on Manhattan. Besides the dashing young pilots, machine gunners and bombers who go sky-side, hundreds of ground men must keep the planes in the air and provide the bombs for them to drop. Drivers nurse their lumbering trucks onto the field loaded with T.N.T., and chemicals. Others bring in empty steel bomb cases. Hundreds of others load bombs in isolated tents, far from hangars.

Some of the men measure the amount of T.N.T. which goes into the 100-pound demolition bombs. Others work on the "big fellows," ranging from the 300-pounders up to the 2,500-pound giants. Still others insert the chemical cartridges which give smoke bombs their potency.

The "big Berthas" among the bombs are not intended for the destruction of a mobile enemy. In the first place, a miss costs too much. And second, very few enemy objectives deserve the dignity of being blown entirely into oblivion. These bombs are intended for objectives similar to New York City, railroad yards, dry docks, ammunition factories and shipyards. It is estimated that three of these 2,500-pound bombs, one landing in the down-



Army bombardment plane, poised for flight, and rows of reserve aerial bombs in storage

town financial district of New York City, another in midtown and the third in the uptown section, not only would put Manhattan Island out of commission, but would destroy residential houses a considerable distance away.

The development of Mitchell Field into a bombardment base is in keeping with a broad plan devised at the time the General Headquarters Air Force was created and the young officer, Maj. Gen. Frank M. Andrews, was placed in command. At Mitchell Field are the headquarters of the Ninth bombardment group composed of the First, Fifth and Ninety-Ninth bombardment squadrons and the Eighth photo section. In addition to these, there are the Ninety-Seventh observation squadron and

the Fourteenth photo section. Mitchell Field is a part of the Second wing of the air force organization. The wing includes the Second bombardment group and Eighth pursuit groups at Langley Field, Va., and the First pursuit group at Selfridge Field, Mt. Clemens, Mich. Of the other two wings, the first is located in the far west, the third in the south.

Units of the various wings are coordinated by a new system of "flying flagships." Each of these is equipped with radios powerful enough so that Maj. Gen. Andrews at Langley, for example, can maintain communication with Col. Walter H. Frank, commanding officer at Mitchell Field, and either or both of these officers can communicate with the commanding officer at Selfridge while all three are in



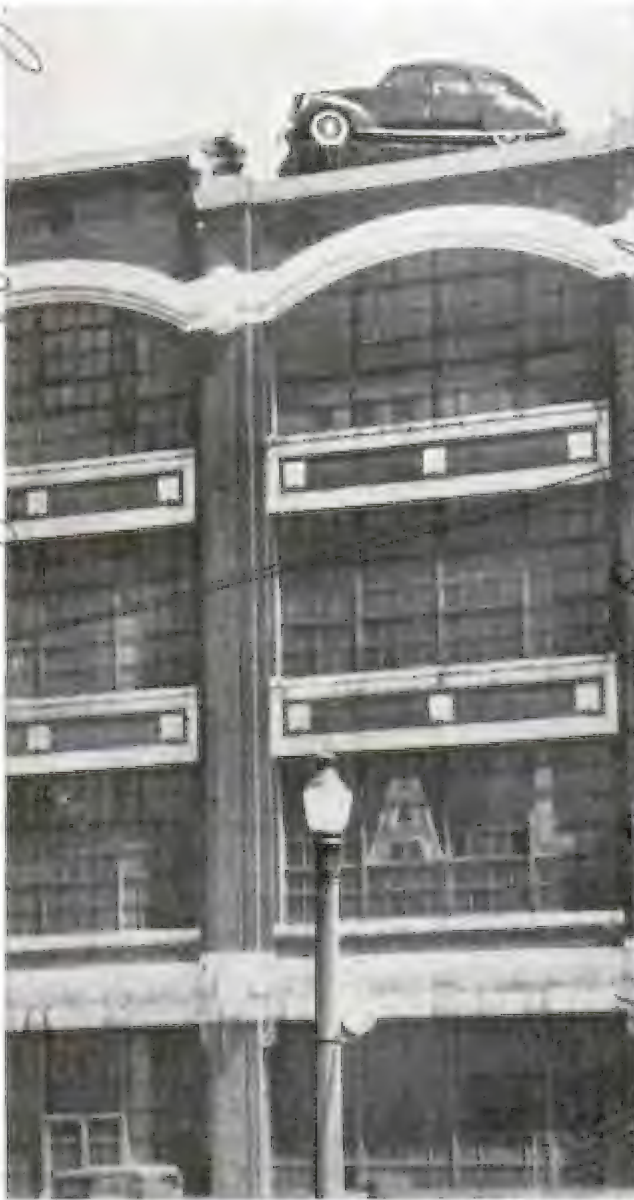
Rear machine gunner's cockpit in a bombardment plane and, above, fitting the wings to a 2,500-pound "angel of death," preparatory to loading it on bomber

the air directing their commands.

This development has changed the type of work done by commanding officers in the air force from that of the protected officer sitting in a bombproof dugout to that of a "Lord Nelson" moving into battle with his brother officers and men aboard the dreadnaughts of the sky. And although the B10b Martin bombardment plane is the largest, fastest and most for-

midable ship of its type now in service, orders for a super-dreadnaught fighter have been placed with the Boeing company. One of these ships was delivered, but it was destroyed. Additional ones will be in service shortly, and it is understood that a few will be commissioned to Mitchell Field where they will help other bombers, the new pursuit ships and scouting planes protect New York City.

Car Atop Dealer's Building Latest in Advertising



Note the full-size automobile perched on top of this building as advertisement

Putting a new automobile atop the building in which he maintains a sales office is the latest wrinkle in advertising. An automobile dealer at Buffalo, N. Y., has attracted considerable attention to his merchandise by installing the car at one corner of the roof.

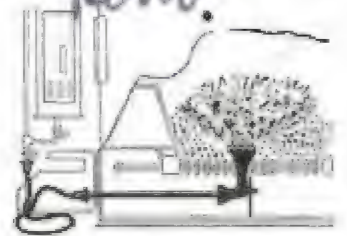
Chemical Land of Opportunity Seen for Industry in South

Today's land of opportunity for the chemical industries—soap, paper, glass, alcohol and resins—is the southland. Chemists foresee a southward trend as industries discover the abundance of raw materials, fuel and power, labor, and the

favorable climatic conditions of that region. Soap is not produced in great quantities in the south, yet the requisite fats, oils, alkalis, sodium silicate and resin are available there. Southern pines promise the pulp for paper industries. Raw materials for glass invite that industry. Synthetic resins may be made from sugar. Glycerin, ethyl alcohol and vegetable casein may be manufactured from southern rice, and the Gulf coast petroleum field may develop synthetic chemicals.

Fire Kindled in Coal Furnace by Portable Gas Lighter

Starting the furnace fire with a gas flame is a quick and easy method. A portable furnace lighter recently developed can be connected with a gas line in the basement and, inserted beneath the grates, kindles a coal or coke fire quite rapidly. When the fire is burning nicely the lighter is removed and hung up in a handy place. It is helpful in "boosting" a low fire, eliminates the need for kindling wood and can also be used as a soldering torch.



Burning Off Paint Is Speeded by Flame Spreader

Constructed to fit the nozzle of any standard blowtorch, a new type flame spreader speeds up the removal of paint by burning. The device causes the flame to emerge from the torch in a flat plane, covering a four-inch area. Sweeping the



Burning paint with flame spreader on blowtorch

Science Service
10/10/36

Lincoln Sales Building, Buffalo, N.Y.

12465 Indiana Ave.
Detroit Mich
F1265
Thomas Products Co. 1645 Indiana Ave.
F1327

James A. Lee, Editor
Chemical and Metallurgical

Turner Bros. Works

flame across a painted surface loosens the paint so that it may be removed easily with a putty knife. The spreader also is handy for removing grease from motors.

Inter-Office Phone Plugs into Any Socket

You can telephone from the bedroom to the kitchen over the electric-light wires, or plug into your office desk lamp and talk to the shipping room. A two-way portable telephone system that utilizes the house wiring circuit has just been demonstrated by a radio inventor. The speaker merely plugs in his portable set at any socket in the building and converses with another person plugged into any other socket.

Firemen Play "Water Ball" with Fire Hoses

Played with a huge rubber ball and streams of water from fire hoses, a new game has been developed by Berlin firemen. The rules forbid touching the ball by hands, feet or any part of the body. Only the streams from the hoses can be used to propel the ball through the goal.



Trying to push ball over goal with streams from hose during game of "water ball" played by Berlin firemen

Huge Spanish Galleon Built for Use in Motion Pictures



Here is the "dry-land" galleon being constructed on a motion-picture lot. It is a duplicate of craft used many years ago by the Spanish

For use in a motion picture, "Fire over England," a huge model of a Spanish galleon was constructed in a field beside the studio. The model, a duplicate of craft used many years ago by the Spanish, is large enough for actors to go through their roles aboard the dry-land ship.

Ditches Reinforced with Cotton Resist Weeds and Erosion

Cotton membrane is being widely used to reinforce the asphalt lining of ditches, making them resist erosion, cracking and breakdown by weeds. Roadside drainage ditches, soil erosion control ditches, irrigation and malaria control ditches are all being built with cotton-reinforced asphalt lining. Five hundred miles of secondary dirt roads have also been surfaced with asphalt reinforced by cotton fabric, and the same method is being applied to airport runways.

and Sol Levy
Chicago Light of December 11, 1920
Wacker
Chicago

at Elmhurst, Pa.
England

320 Broadway
New York

C. K. Evers

Radio Signal Replaces Bomb in Target Practice for Pilots



Camera obscura pointed at bombing plane in sky records its position when radio signal tells of missile dropped at target

Instead of dropping actual bombs, army pilots in bombing practice at March Field, California, send a radio impulse at their target. A huge camera obscura mounted on wheels is the target. Sighting it from the sky, the pilot sends a radio signal which is recorded by the camera operator on the ground. He marks the position of the plane and the spot where the imaginary missile would hit. This method trains the army flyers in accuracy without wasteful expense for real explosives.

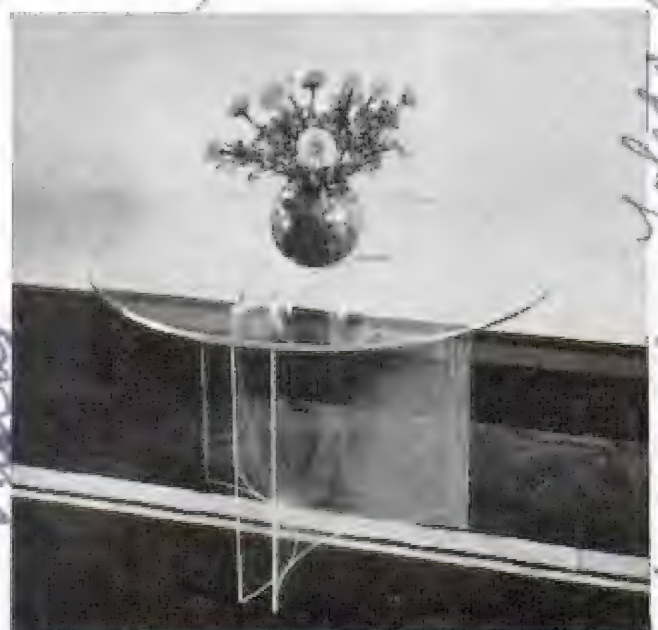
Speeding Up Metal Hardening Aids Auto Industry

Development of a revolutionary process for hardening metal surfaces by electrical induction is hailed by the automobile industry as an advancement which will speed up production methods and improve the quality of crankshafts for all kinds of engines. The method reduces hours of sur-

face-hardening time to seconds and produces a regulated, exact result, superior in many ways to the surface produced by furnace hardening. For the new treatment, a high-frequency current at high voltage is transformed into low voltage with high amperage. This current passes into inductor blocks which surround, but do not touch, the bearing surface desired to harden. The inductor block current induces a current in the surface of the metal and this induced current is the heating factor. When the area to be heated has been subjected to the controlled high-frequency current for the correct length of time the electrical circuit is opened and the heated surface is quenched with spray from a water jacket built into the inductor block. When all the main, intermediate and pin bearings are hardened, the entire crankshaft is drawn at a low temperature to remove strains.

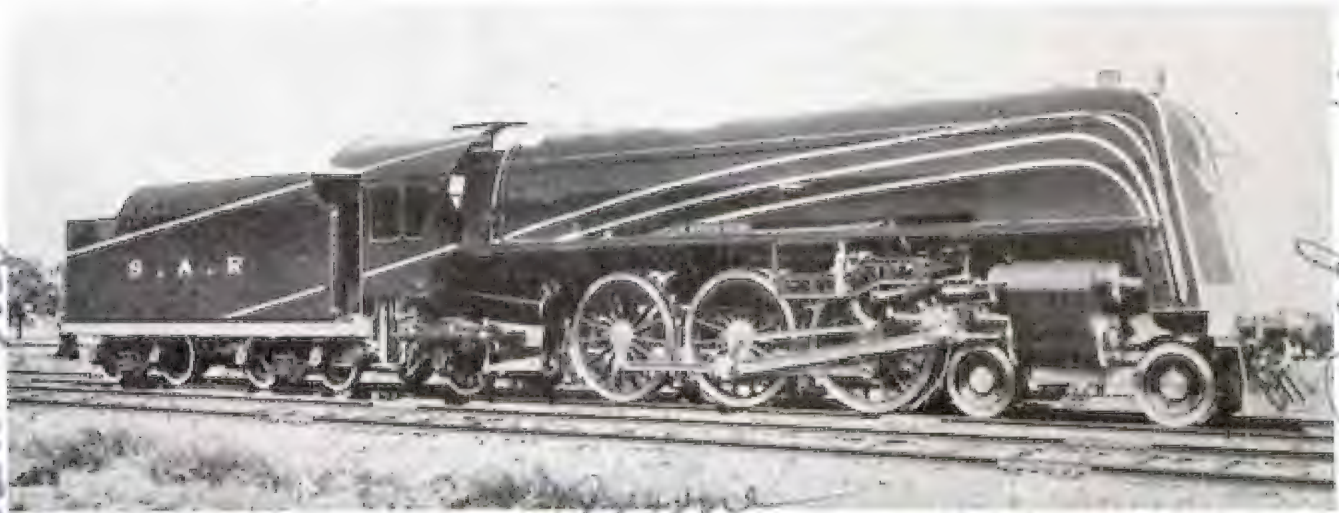
Glass Table for Home Is Decorative Touch

Made entirely of glass, the latest table enhances the beauty of the modern home without clashing with decorative schemes. It has a circular top which rests on three glass supports.



This is the latest touch in home decoration—a table made entirely of glass

Latest Australian Locomotive Is Streamlined



This oddly decorated hood on the latest Australian locomotive gives it an appearance of speed. The locomotive is a part of the South Australian Railways' new equipment designed for efficient operation.

Fitted with a streamline hood designed to reduce wind resistance and increase speed, the latest Australian-built locomotive is claimed to be more efficient in operation than the engine of conventional design. The locomotive is one exhibit in South Australia's centennial celebration, which will include examples of how the public utilities, especially the government railways, are endeavoring to bring equipment to the highest standard of efficiency.

Coal Model of the Mississippi to Give Flood-Control Data

Army engineers contemplate constructing a scale model of the Mississippi river watershed one-fifth of a mile long on a 400-acre tract near Vicksburg, Miss. And the river model, complete in detail, will be made of coal. Coal was selected because it could be obtained within specific gravity limits of 1.30 and 1.40, thus enabling the engineers to determine many facts about the river and the action and strength of the water as coal boulders of various sizes are moved by the current in the model watershed. Small rainstorms will be utilized to duplicate conditions in the watershed and accurate data for flood control may be obtained.

Shower baths can be equipped with a thermostatic regulator to deliver water at a fixed temperature regardless of changes in pressure or temperature in the pipes.

Lathe Made to Cut Grooves by Spindle Gripping Tool

Ordinary lathes can be converted into machines for general slotting work by attaching a spindle gripping tool. This device is constructed simply, resembling a vertical parallel vise equipped with precision jaws. Bolted to the lathe tool holder, it allows the lathe to be used for milling, grooving, slotting, recutting cotter holes, and rough-cutting surfaces.



Spindle gripping tool at right is used to convert lathe into tool for slotting and grooving work

Wandachter Werkzeuge, Wandachter
40 / Large Reihe, Wandachter
Hamburg, Germany
no U.S. Agent

Holman Co., 75 Horton

The HOME that



**what a
kilowatt-
hour will
do for you**

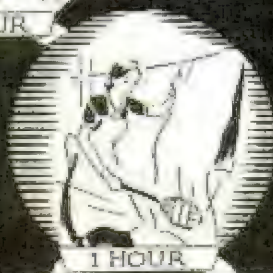
PART I

THIS is the story of a humble, hard-working household drudge, a maid-of-all-work employed by a family in Schenectady, N. Y. They call her Handy Annie and pay her only \$2.41 a week.

Despite her low wages, Annie is an ideal maid—quiet, efficient, tireless, a regular bundle of energy. She never heard of a forty-hour week or Thursdays off. She never asks for a vacation or a raise. In fact, Annie works twenty-four hours a day and does as much as eighteen men could accomplish if they labored eight hours a day and seven days a week.

Among a lot of other things, this family expects Annie to tend the furnace and hot-water heater, turn the clothes washer, dry the clothes in bad weather and run the ironer, cook the food and see that it is kept fresh and edible, wash and dry the dishes, dispose of the garbage, vacuum clean the rugs, keep the house at a comfortable temperature summer and winter, run the sewing machine, wake the family and provide healthful exercise and sun baths, get rid of flies and insects, discourage burglars, help nurse the sick by supplying hot or cold pads as required, help tend the gold-fish and provide music and entertainment.

That's a big order for one \$2.41-a-week maid. Almost any family



**13 people
working
one hour**

Work, in the electrified home, is interpreted in kilowatt-hours, and here's the work a kilowatt-hour will do—the combined efforts of thirteen servants for one hour

1724

Runs Itself



could afford a servant who would do all that work—and a lot more—for such wages. But where, you inquire rather enviously, could you find another Annie, even if you were heartless enough to work such a simple-minded girl to death?

Well, servants like Annie make just one demand. They won't work in unwired homes. But if you light your lamps by flipping a switch instead of a match, then there's an Annie ready to go to work for you too. As a matter of fact, she's already working for you. The difference between you and the people in Schenectady is that they're working their Annie



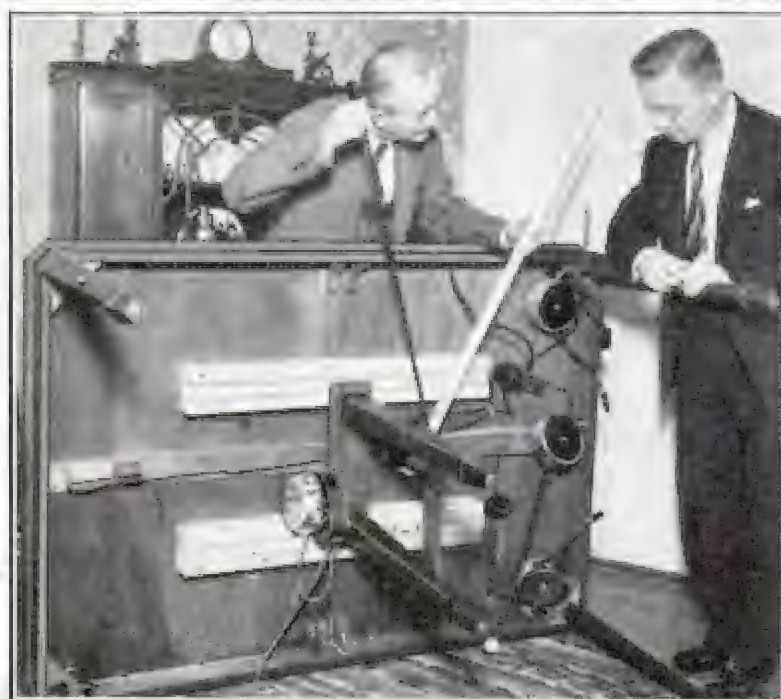
Photos: Courtesy General Electric Co.

Electricity is the Handy Annie which does the work in this home that runs itself. Mr. Ripley is pointing out the illuminated house number. Above, the lighted entrance and the little lamp and reducer that do the trick

lamp and reducer - Annie store.

Edm. & Pub. Co. Sept.

ny
51



Mr. and Mrs. Ripley enjoying an electric breakfast—and if you don't think the dining-room table is electrified, glance at the picture to the left. The reels wind up the cords automatically so no unsightly wires are exposed

more freely than it uses water—and with amazing results. Nothing in this home is done by hand if it can be done by electricity. That's why Annie has so much work to do.

It all started more than eight years ago. Charles M. Ripley, his wife and young son lived in a neat, six-room, two-story colonial cottage on a quiet residential street. Days Mr. Ripley wrote copy designed to help sell big turbines, generators, and motors,

twenty-four hours a day while you probably work yours only three or four. The Handy Annie each of you employs is electricity and her tools are electrical household appliances.

More than twenty years ago, Dr. Charles P. Steinmetz, the electrical wizard, predicted that some day we would use electricity as freely as water. That day has not yet arrived for us as a nation, but it has for one family. This Schenectady family actually uses electricity in the home

which do the work of hundreds of men. His evenings were occupied with home work—stoking the coal furnace, carrying out ashes, disposing of garbage, helping with the dishes.

These chores irked Mr. Ripley. Why, he meditated one evening, didn't someone supply equipment to run a home as efficiently as a factory? Then it occurred to him that there were plenty of electrical home appliances on the market, machines to do the very work he was doing. Why



The electrified kitchen with its range, dishwasher, garbage preventer, food mixer, flour mill, radio, clock, fan, lights and many other appliances

wasn't he using some of them? He guessed they cost too much, or would run his light bill way up. But he decided to investigate.

He went about it rather timidly. What he needed most of all, he figured, was an electric washer. Finally he bought one on the installment plan and paid for it with the \$15 a month he had been paying a laundress. The "juice" to run

RIPLEY SAYS:

Whatever we need, we pay for, whether we buy it or not.

It costs less to live better.

A good electric washer has the strength of four women, yet the current to run it costs only about \$1.25 a year.

The bathroom was the invention of the last generation, the electric kitchen and laundry were creations of this generation.

The all-electric home will be next. Then a recreation room for radio, movies, television.

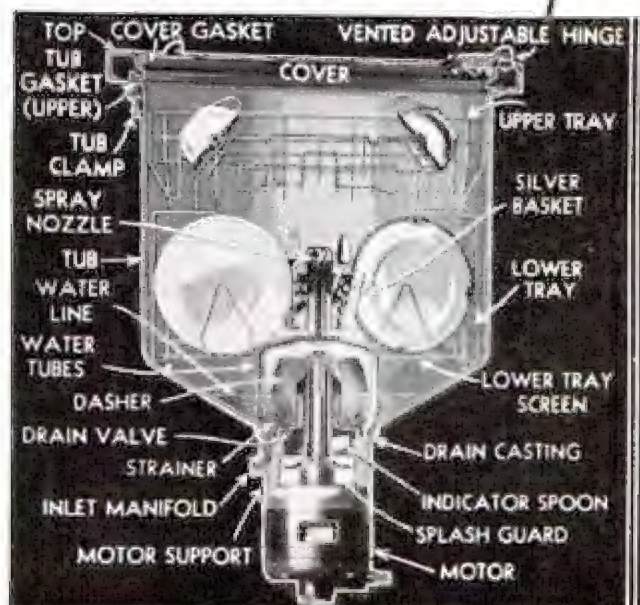


Diagram of the electric dishwasher. Put the dishes in, turn on the water and the "juice," and Handy Annie does the rest

it cost \$1.25 a year. When the washer was paid for, he wondered what to do with the \$15 a month he had been paying the laundress. So he bought a refrigerator, using the \$15 and the money he saved on ice and food to pay for that. The refrigerator cost \$1.25 a month to operate, but he paid that too with money saved on ice and laundress bills.

Then he really got into the spirit of the thing. Why worry, he asked himself, if you can buy electrical home equipment and pay for it out of what the equip-



Garbage preventer such as is employed in the electric home and diagram showing working parts. Dump the garbage in, turn on the motor and Handy Annie does the rest

ment saves? So, one at a time, he added other appliances. Year by year, he bought an electric range, an ironing machine, a dishwasher, an oil furnace electrically controlled, a laundry dryer, an air conditioner and an electric garbage preventer. In between, he purchased dozens of smaller appliances—door chimes, bug killers, vacuum cleaners, clocks, a room cooler, sun lamps, heating pads, fans, an exerciser, toaster, coffee maker, egg cooker, electric double boiler—anything which would save work or add health and comfort to his home.

Today the life of Reilly has nothing on the life of Ripley. This family lives in a home that virtually runs itself. Annie does the work, much of it automatically, without supervision or attention. Let's pay the Ripleys a visit and see just how an electric home runs itself.

Over the door you'll find a glass plate

with the house number on it. Back of the plate is a seven-watt bulb that burns all night. No striking matches hunting for this home, even on the darkest night. Press the doorbell and you hear the tinkle of chimes. Press again and you get another tune. The doorbell has a repertoire of six melodies and doubles as a dinner gong by virtue of a set of keys inside the house connected to the same chimes. In the garden is another chime to soothe the ears. Yes, it's electric too.

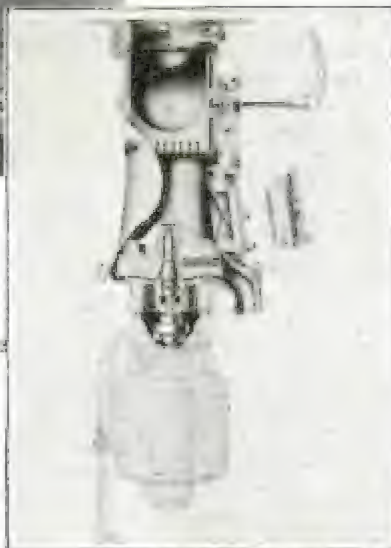
Four floor and table lamps in the living room shed a soft glow without shadows and without glare, although each of those lamps contains a 100 or 150-watt bulb. The light is diffused by frosted-glass globes and by reflection from the ceiling. There's probably twice as much light here as in the average living room, but there's no sense of brilliant illumination. A room cooler augments the air conditioner in the

basement and a radio plays softly.

"Watch the smoke from this cigar," directs Mr. Ripley. He puffs rapidly. The smoke curls upward, drifts back of a bookcase and vanishes.

"An air vent back there does the trick," he explains. "It's part of the air-conditioning system.

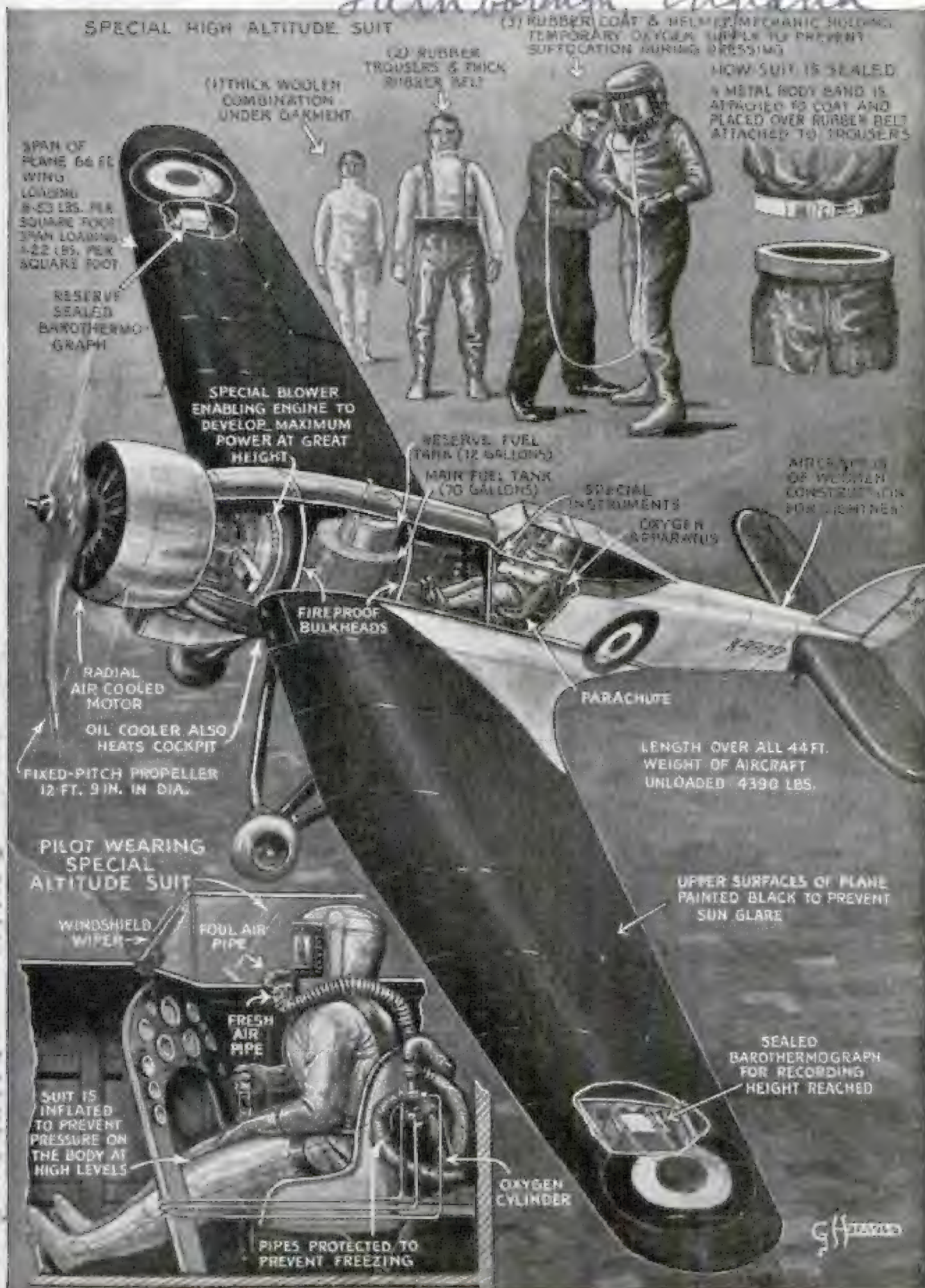
(Continued to page 144A)



One of the features of the electric home is an electric floor polisher—no crawling about on hands and knees here

Record Set by Plane Designed for High Flying

Experimental Station, Royal Aircraft
Farnborough, England



British monoplane which set altitude record of 49,967 feet recently is shown, in sketches and cross-section views, to have been designed especially for high flying. Note special suit worn by the pilot

British Aeroplanes Co. Ltd.

Battleships Fire at Radio-Controlled Plane



Here is the radio-controlled plane at the moment it was launched from British battleship by catapult. Note that the pilot is missing from the cockpit. Anti-aircraft fire failed to damage the robot craft

While an officer on the bridge of one warship operated an unoccupied plane by radio, gunners of this and another ship fired numerous shots at their flying target in recent maneuvers of the British fleet. At the end of the test, the plane made a perfect landing and was safely hoisted on

board, untouched by the anti-aircraft fire of two of Britain's most powerful battleships. The plane was launched by catapult from one of the ships. Every movement of the flying target was in response to manipulation of controls on the switchboard at which the "pilot" stood.

Small Tent Is Rigged in Stands for Rainy-Day Games



High and dry in their shelter at football game while other spectators sit in rain

For protection from rain while they witnessed a football game, one couple rigged up a small tent in the stands at Columbia, S. C. The shelter consisted of a piece of canvas stretched over sections of light iron pipe which were attached to the stands and which held the top of the tent in place. The canvas extended down to seat level at the back to keep the occupants dry. The shelter covered only the two seats occupied by the enterprising couple.

Automobile Driven Like Rocket by Ejecting Air Centrifugally

Without any connection between power plant and wheels, an automobile invented by a French engineer is driven by throw-

al. noites.

University Stadium
Memo 10/14/36
Dept. of Commerce

ing air centrifugally toward the rear. The inventor holds that centrifugal ejection is fifty per cent more efficient than the use of a propeller. His car is a three-wheeled, low hung vehicle seating one person, and with a nine-horsepower gasoline engine driving its air-expulsion system it is said to have traveled fifty miles an hour. The engineer is studying methods of propelling boats and airplanes by centrifugal ejection of air and water.

F1362

Light Beam Stopped by Whirling Disk Plays Chords

Producing music from light is one of the feats of electrical magicians. Shining a hand flashlight beam through perforations in a revolving disk upon an amplifier, a California electrician caused major and minor chords and bugle calls to be played. The light rays were changed into controlled sound vibrations.



As electrician focuses light on amplifier, interruptions by perforated disk cause musical chords

Rotating Frame for Big 'Eye' Is Built Like Five-Story Kite



Scale model, made of glass, of the revolving frame for the world's largest telescope. The actual frame will be of steel, five stories high

Five-story steel structures fitted together like sticks crossed to make a kite will form the body of the \$6,000,000 telescope which, when installed on Mt. Palomar in California about 1940, will be the world's largest "eye." This frame for the 200-inch glass mirror consists of a steel tube or barrel five stories high by twenty-two feet in diameter; a yoke shaped like a tuning fork, and a horseshoe. The tube will be hung at its middle on an axle lying between the two sides of the fork. This steel skeleton fork will lie parallel to the earth's axis, at an angle of about thirty-three degrees to the earth's surface. A five-story steel horseshoe will support the upper end of the fork, the top, open end of the horseshoe bolted to the fork. The telescope thus can be swung in all directions and pointed to any spot in the sky. The 500-ton mass will float on a thin film of oil under a pressure of 200 pounds to the square inch.

When North Sea gales exert a pressure of more than twenty-eight pounds per square inch against a railroad bridge in England a bell warns trains not to cross.

Chicago Tribune 10/16/36

Santa Monica

The Sphere

TROUBLE SHOOTER



kilowatt hours. The man who maintains this system at top efficiency, who supervises the repair of breaks, whose orders are obeyed to the letter, is the power director. He sits beside his telephone and switches. Before him is the huge model board of the New York terminal area, an elaborate hand-painted chart showing the 541 miles of overhead trolley in the world's busiest railroad zone. Dozens of tiny red, green, and white lights blink and twinkle. The power director seems to be taking it easy most of the time, but his senses are alert to every new situation. Preparedness is in his

"TRAINS must run!"

That's the eternal slogan before a Pennsylvania railroad power director. Trains can't run without power, and the maintenance of scheduled service against all odds is what makes this one of the most thrilling and responsible jobs in railroading.

Almost any minute of the day, a train heads east or west from Pennsylvania station in New York and dives under a deep river. The westbound trains are hauled by mammoth ninety-mile-an-hour locomotives, 230-ton "juice eaters." The annual consumption of power for the entire single-phase operation between New York and Washington is stupendous. The present traffic movement consumes approximately 563,000,000



Top, model board of New York terminal area. Below, drawing circuits on power director's model board

for a RAILROAD

eyes. Ask him what he would do in a hundred different emergencies and his answers are ready.

When the telephone bell drones, the power director hunches over the mouthpiece.

"Short circuit on Track nine," says a voice. "Train from Pittsburgh stopped."

"Stand by," replies the director.

Without pause he summons the sub-station operator and directs him to manipulate the controls that will restore service on Track nine.

Why did the circuit breakers trip to cause the



Rotary converter in power sub-station, and electric locomotive leaving New York terminal

short circuit? Nobody seems to know at the moment. No matter what the cause, the first duty of the power director is to energize that train from Pittsburgh. Not until after he closes the circuit does he inquire into the reason for the power break.

Short circuits are possible from numerous causes. In fact, nothing would surprise a power director. Once a live snake found its way into Pennsylvania station and stopped several trains with a short circuit. Mr. Pigeon is a notorious short circuiter. If he alights on a messenger wire and flaps his wings against the overhead structure, the contact trips the circuit breakers. Then, with a report like a twelve-inch naval gun, and a blue lightning flash as



Load dispatcher's office in the Pennsylvania station, Philadelphia, and, above, throwing a switch in a power sub-station

The weather is something else that worries the power director. In winter, icicles fall from overhead structures and quite frequently ground a trolley wire. To prevent short circuits, men walk along the tracks with long poles and break off the icicles. These poles have been treated with paraffin and insulating varnish. As added precaution, the men wear rubber gloves tested for 10,000 volts.

Major trouble has never occurred since the Pennsylvania railroad was electrified. The power director is mostly concerned with routine work, such as repairing broken circuits and granting permits to work trains to put a grinding device on a circuit. But there are dramatic moments. Ticklish situations arise when fire

big as a man, the poor pigeon turns to charcoal, and the trains stop running. Service must be restored by orders from the power director.

Creatures smaller than pigeons and snakes can also put an electric railroad temporarily out of commission. A sparrow or a canary bird have in this fashion stopped a mighty steel locomotive.

breaks out along an electrified right of way. The local fire chief usually calls the power director and requests that the power be shut off along a certain section of track. The power director finds the spot on the map and gives his orders.

Firemen are cautioned to exercise great care around a railroad power line. An electric current can actually travel along

a stream of water and kill the man who holds the hose. Kites are no less dangerous in wet or damp weather. If a kite merely touches the railroad power line, the current can travel down at lightning speed and electrocute the person standing on the ground.

The power director stands at the nerve center of a traffic control system so ingeniously interlocked that it can handle about 650 scheduled trains every twenty-four hours without delays or confusion. About 200,000,000 kilowatt hours are consumed by the direct-current third rail in this single zone in a year. More than one-third of the electrified trackage of America's standard railroads lies between New York and Washington. In all, the Pennsylvania operates 1,345 trolley miles.



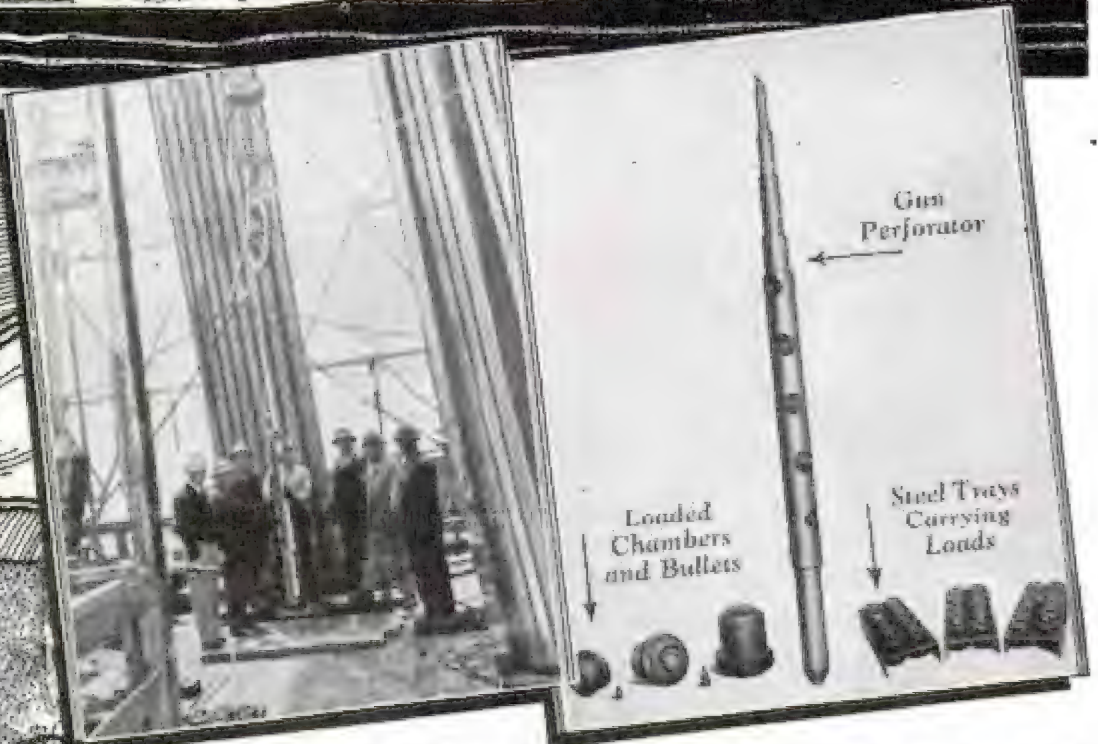
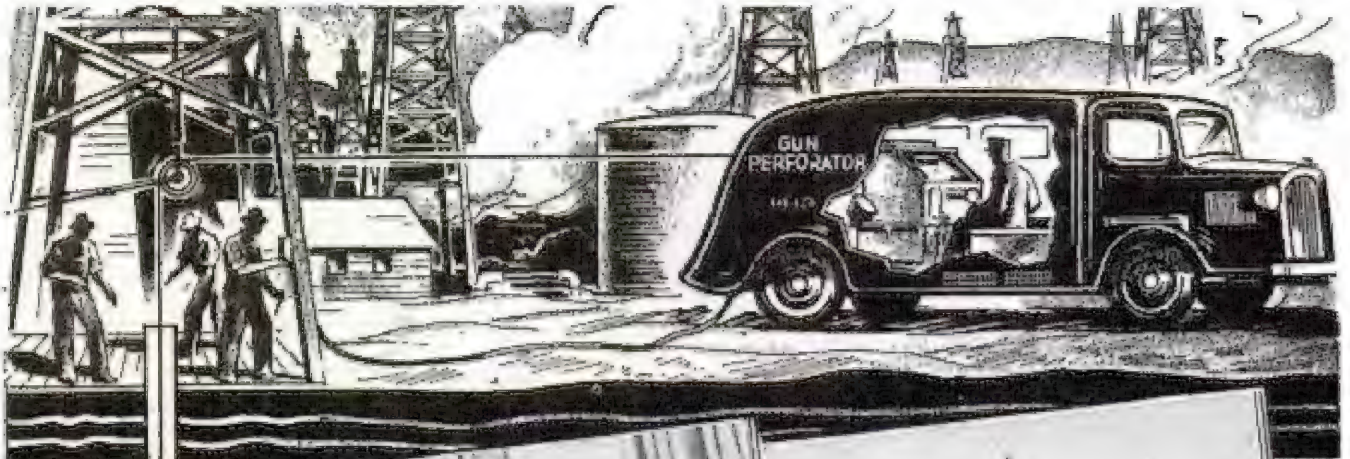
Interior of the main signal tower in the Pennsylvania station, New York City, and, above, the power director at work

The load dispatcher in Philadelphia has centralized control over power on the 132,000-volt circuits, which supply power to all the trains. In each sub-station, the main power transformers step down the voltage from 132,000 to a mere 11,000, which is then distributed to the overhead trolleys. Third-rail operation is supplied with direct current of 675 volts.

Only one load dispatcher is necessary for handling the immense river of electric current needed to keep the heavy steel trains running. But it takes seven power directors and their assistants to maintain the operation. The load dispatcher's duties keep him in contact only with the power-generating stations, but the power

(Continued to page 126A)

Powerful Gun's Bullets Tap New Oil Pockets



Sketch shows how bullets are fired from gun in well by remote control in truck. Photo, left, shows gun ready for lowering. Right, parts of the oil-well gun

Shooting into the depths of the earth with a powerful gun is the latest means of tapping new pockets of oil. The gun perforator, as the device is known, consists of a solid shaft of steel into which are recessed ten to fifteen firing chambers for discharging forty-five caliber high-test steel bullets. This bullet is powerful enough to penetrate three steel casings of the type used in oil wells and the intervening layers of cement, without mushrooming or breaking. The casings are a total of three-fourths of an inch in thickness, the cement several inches. The gun is used to advantage in oil wells which were rushed to completion into a certain formation, to the neglect of all others. If the exact thickness of each stratum is known from coring, each can be shot for new production by lowering the gun to the proper depth and discharging bullets through the casings into the sand. The gun also may be used to help deepen wells. Another use is the rejuvenation of wells where gas pressure has run low. With the gun a single shot is fired into stratum likely to contain gas. Other shots may be discharged at other favorable depths until gas is found. A "shooter" sitting in the control department of a perforator truck fires the gun electrically after

recd June 1940 - 872
240

it has been lowered on a steel cable into the well. The shots may be fired one at a time or all together. The entire gun assembly is watertight, permitting it to be lowered and fired under hundreds, perhaps thousands of feet of water. A dial in the control cab shows the depth of the gun, another indicates the strain on the cable. The gun is lowered on a steel cable that has an electrical conductor in the center instead of a hemp core.

Locked Drain Lid Saves Burns in Cooking

Designed to save time and to prevent painful burns, a drain lid which may be locked on cooking vessels is on the market. The lid is held securely in place so that food is retained in the vessel while the water is being drained off. This reduces waste by



Draining water from vegetables with one hand is easy with this type of vessel

preventing food from spilling and saves the bother of draining through a colander. The vessel may be set on its side on the drain board and left to drain itself.

Fast Freight Takes to Air Aboard the 'Flying Boxcar'



Air-line "stevedores" load cargo aboard a "flying boxcar." Tri-motored Ford planes have been put into freight-carrying service by TWA

Freight doesn't take the sidetrack for the passenger flyer on the air lines. Heavy cargo rides through on the "flying boxcar" at nearly the same fast schedule as the sky liners. A fleet of these all-metal, multi-motored transport ships is being assembled for air freight and express service across the country.

Age of Invention Still in Infancy with Whole Industries Unborn

We live in a scientific age, yet scientific invention and discovery are still in their infancy. Dr. E. R. Weidlein, president-elect of the American Chemical Society, believes the automobile is only ten per cent developed, the radio only a day old, television less than an hour old in the light of existing scientific knowledge. Transportation, he says, has just begun to benefit from science, and modernization of homes presents a great industrial opportunity. Whole new industries are being created in 1,600 American research laboratories where scientists are striving to develop new products and find new uses for old ones.

Wentworth Mellon distributed progress
Pittsburgh, Pa.

Cook Rite Utensils
77 29th Street, Pittsburg, Pa.

330 W. 42nd
New York

Fireworks Etching of King

F138 | Ready for Coronation Show



Features of King Edward VIII will blaze in fireworks when this big set piece is lighted at coronation celebration

King Edward's coronation at London this year will be the signal for a spectacular fireworks display. Aerial bombs will be exploded, rockets and star-bursts will brighten the night skies, and elaborate set pieces will be lighted at celebrations on the ground. Manufacturers are busy preparing for the big show. One of the set pieces portrays the head of the king.

Era of Wood Is Just Arriving

F142 | as Uses for It Increase

Most of us probably think we are emerging from the era of wood. Not so the United States Forest Service. We are just growing into the age of wood, says this bureau of the government. At the Forest Products Laboratory at Madison, Wis., scientists are testing the practicability of prefabricated houses of wood to be built

by mass production in factories and erected complete in a week or less. The laboratory also is improving methods of making joints and fastenings so timbers can be used more efficiently for bridges, arched halls and hangars. One advantage of wood is that it is renewable because we can grow successive crops. About 50,000,000 board feet of wood are used in the United States annually, enough to build a boardwalk forty feet wide and an inch thick from the earth to the moon. More than one-half this wood goes into building construction. The second largest use is for fuel and experts predict that by 1950 we will be using 25,000,000 tons of wood pulp each year, which is twice our present consumption.

Twin 'Eyes' Count Vehicles but Ignore Pedestrians

Pedestrians can walk unnoticed past the electric traffic counter posted at a roadside in southern Illinois. But the twin "eyes" never miss an automobile! Two "electric eyes" are mounted on the ends of the crossbar of a T-shaped post set in a concrete base, and any vehicle long enough to cut off the two beams of light focused on both photocells from across the road is counted.



Passing vehicles are counted as they interrupt light beam focused on photo-cells on arms of post

Experimental Plane Tests Overweather Flight

Blazing the "overweather" trail that giant air transports of the future may follow, a flying laboratory is testing the performance of men, motor and plane six miles above the earth for Transcontinental & Western Air, Inc. Airmen prophesy that intercity and intercontinent planes of tomorrow will cruise at superspeeds high above the earth's weather,



Flying laboratory ready to try air lanes above earth's weather. Above at right, pilot talking into microphone. Below, observer with oxygen tube in mouth watches instruments in closed forward cockpit



ignoring the storms and winds below. In the TWA experimental ship D. W. Tomlinson, pilot, and James Heistand, observer, have tried altitudes above 30,000 feet, encountering temperatures eighteen below zero but wearing only summer clothing because their cabin is heated, the pilot's cockpit having a sliding glass hood framed with metal. For helmet, Tomlinson wears only a knotted handkerchief to shield his head from the brilliant sun. A radio microphone fastened in front of his mouth permits him to communicate with ground stations, leaving his hands free for the controls. Both men breathe oxygen at high altitudes through a mouth tube, but it is expected that when sub-stratosphere passenger service begins the cabins will be supplied with air pressure, and oxygen tubes to individual passengers will not be necessary. While the observer jots notes concerning the performance of the plane, photographic records of the instruments

are made at every thousand-foot level. A camera is mounted at the rear of the observer's compartment, focused on the instrument panel, which is illuminated by two special lights for photographic purposes. The low-wing monoplane is powered by the same 715-horsepower engine used on the twin-motored passenger ships.

Traps with rubber jaws which do not break bones nor even injure the fur are being used to catch mink and muskrat.

Charles H. Briddell



Blue sky over a big city is the skywriter's billboard. In circle, Jim Rose. Below, flight chart on instrument board, printed backward because he flies above and "behind" his letters

HANGING out smoke signs on the blue sky looks easy. You stand there on solid ground watching the flying penman a mile or so above the city spell out in leisurely fashion the big block letters of an advertising slogan. You'd like to try it yourself. It looks simple enough. But it isn't.

You can count the skywriters on your fingers. Jimmy Rose, "pro" at the little Elmhurst, Ill., airport, knows but three men in this specialized branch of aviation. Art Goebel, who flew to fame in a Honolulu derby several years ago, is one of them. Jim Rose, himself, is another.

There is more to this skywriting business than climbing up on a nice day and blowing smoke rings out of the exhaust. You may sign your name beautifully on the back of a check and print the most artistic letters with your pencil, using the art gum to correct any lines off center. It's quite something else to dash off a mes-

Flying Penman



sage three miles long in letters a half mile high, while you're roaring through thin air at two and one-half miles a minute, remembering to write backward and not drop out any vowels because if you misspell you're done for. There's no erasing.

One reason why there are so few skywriting experts in the land today is equipment required. Any old crate won't do. You need a hill-climbing ship with plenty of engine up in the nose, one that won't cough and gasp when it gets into the rarified atmosphere where smoke letters don't blow away. Jim Rose flies a two-seater Travelair biplane with a 330-horsepower Wright Whirlwind motor, a trim little ship



Top, the flying penman ready to climb up three miles and hang out signs. Notice the oversized exhaust, heavily swathed in asbestos to hold its heat. Below, the same plane leaving its trail of white smoke



able to get up there in a hurry. He lifts it off the dirt in a matter of seconds, seems to stand it on its tail in climbing 2,000 feet per minute for the first 6,000 feet and then gathers 800 feet altitude every minute until he finds a spot from 10,000 to 17,000 feet high where, if you were a cook, you'd say you had reached the "soft-ball stage." The smoke hangs together like hot fudge dropped in cold water.

Ask Jim Rose for his recipe for skywriting. He won't tell you all of it. He'll tell you this: you need a body, a brain and a ship that can "take it" two or three miles up; a good memory; paper, pencil and a mirror; an exhaust pipe that will keep you from coming home a cinder; plenty of experience and—the trade secret—a formula for sticky smoke.

Jim takes the back seat in his plane. That formula takes the front seat. Installed in the forward cockpit is a special tank full of a light paraffin oil for smoke making. There is a chemical added to this oil to hold the smoke together, and what that chemical is, is the flying penman's private affair.

"It must be a dense smoke, but it must

also break clean when the smoke throttle is shut," the flyer explains.

"Molasses would make smoke, but not the right kind. The secret chemical is what does the trick."

This oil compound is pumped with an engine pump under forty pounds pressure through a three-eighths inch pipe into the exhaust pipe below the motor, where the heat of the burned gas converts it into white smoke. A grip on the pilot's stick



Skywriter above is stunting. His smoke is not holding well enough for lettering. The chart shows how a flyer would maneuver to write "Popular Mechanics" in block letters, which are easier to line up than script

controls the oil flow, and he must remember to allow for a twenty-foot trail of smoke after he shuts the valve. The exhaust pipe itself is especially built, eight feet long and six inches in diameter, with welded joints to withstand vibration, and wrapped in plenty of asbestos. Even with that fireproof sheath, Jim Rose sometimes wonders why he and his ship haven't turned into a blazing rocket, for that oil is dangerous stuff. Its flash point is 280 degrees Fahrenheit, and Rose himself has found 1,000-degree temperatures at the mouth of his exhaust. There are good reasons for that oil-smoke to burst into flame as it leaves the exhaust; but it hasn't yet, perhaps because of the cold that strikes the smoke as it emerges, the high speed, the thin atmosphere. Being sane, the flying penman plays no pranks

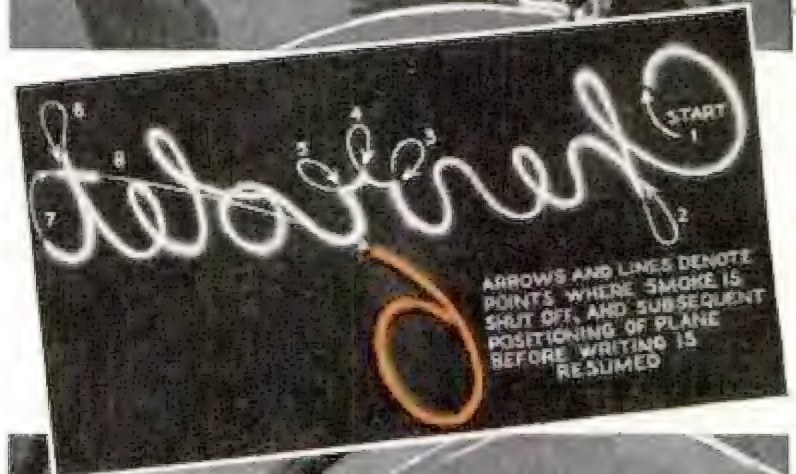
in the air and takes no unnecessary chances. His only serious mishap has been a rocky landing in a sudden gusty storm that flipped him on his nose as he hit the earth. Practically every "bone" in the plane's body was broken but his own were intact.

Like a navigator, the skywriter's first task is to chart his flight. That is where paper, pencil and mirror come in. He draws his words on paper as if writing from the back of a billboard, for, when he is in the air, he is flying above and behind his sign and it must be read from below. He holds the completed drawing in front of a mirror to check it for spelling and appearance. Then, starting with the first letter, he sketches in arrows to guide his flight in the quickest course, memorizes that course, posts his chart on the instrument board with adhesive tape, tanks up with plenty of gasoline, lubricant and smoke-oil and is ready to hop.

Grey days are holidays. Smoke-writing is useless without a blue background. Wind may ruin your penmanship, so you must seek a level of calm, cold air. Jim Rose prefers to fly around 17,000 feet high. At that altitude you may encounter horizontal winds, but these do not necessarily spoil your day, for in the air you are a part of the air, your plane drifts just as the letters drift and you can disregard wind. Convection currents, however, are another thing. These rising and falling currents of hot and cold air can tear your sign apart and make it unreadable before you have crossed the final "t." If you run into vertical currents you must either climb above them or forget the whole business until tomorrow.

Block letters are easier to line up. Script is not difficult to chart, but hard to write and uses more oil, for you must write the connecting links and that costs money.

(Continued to page 124A)



It takes more oil to write script, for the letters are all connected and smoke is shut off for only a few swift turns, indicated by light lines with arrows in chart drawn by Skywriter Jim Rose. In bottom picture can be seen the pilot's stick with the grip, attached, which controls a smoke-oil flow

Electric Scoreboard Flashes Results of Races

Numbers of first, second, third, fourth and fifth place horses are flashed in electric lights on a large scoreboard installed recently at a Maryland race track. In addition the board shows whether a foul claim is entered after a race and whether the finish is close enough to be declared a dead heat, two or more horses crossing the line together. The scoreboard is operated by remote control from a switchboard on which are several rows of push buttons.



Top, operator at control board of race track announcer scoreboard. Bottom, how the board appears with numbers of horses in one, two, three and four positions



Streamline Trailer for Bicycle Has Lights and a Radio

Equipped with battery-operated taillights and radio, a streamline trailer for bicycles has been patented. Its length is

five feet. Bullet-shaped and dustproof, the trailer has a double-door hinged top to permit easy removal of its contents. A storage battery anchored in the rear helps to balance the load and provides sufficient current to operate the dual taillights and the radio controlled from the handlebars. The vehicle was designed for picnickers, campers and delivery purposes.



Trailer, with top open for loading, attached to bike. Note the smart appearance

Giant Ocean "Sleeper" Planes to Carry Sixty Passengers

Clipper ships of tomorrow, six great Boeing flying boats now in the engineering stage of development, will be double-decked liners capable of carrying more than sixty passengers across the sea. The first of the fleet will be ready for Pan-

Boeing Aircraft Co
2001 W. Michigan

Seamen Cling to the Rigging as Whaler Plunges to Bottom

American Airways late in 1937. Sleeping accommodations will be available for forty passengers on night flights over the ocean. On the upper deck will be an elaborate control cabin, cabins for the crew and baggage compartment; the lower deck will house passenger quarters, galley, lavatories and dressing rooms. Passageways through the wings will permit servicing and inspection of the engines during flight. For the comfort and enjoyment of sky cruises between continents, the cabins will be soundproof, heated and ventilated, and provided with reading lamps and broad windows. With gross weight of more than 82,000 pounds, wing spread of 152 feet and length of 109 feet, the flying boats will be true giants of the air. Of the high-wing monoplane type, they will ride the water on short stub-wing hydro stabilizers instead of the conventional wing-tip floats.



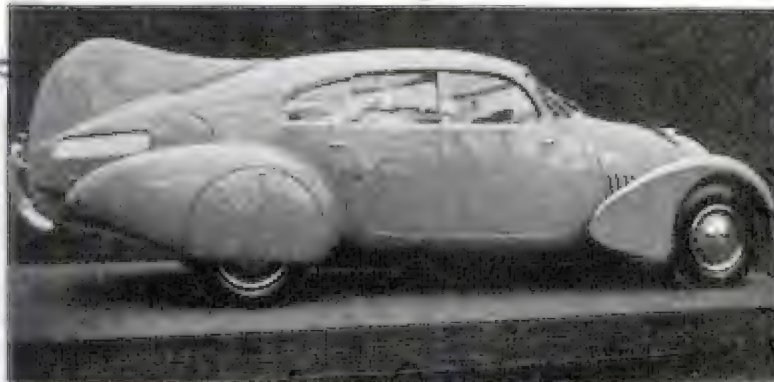
© Planet News, Ltd.

Awaiting rescue as their whaling ship goes down, several members of the "Sol Hagen's" crew can be seen clinging to the rigging

One of the tragedies of the sea was caught by the camera as the Norwegian whaler "Sol Hagen" plunged to the bottom in Table bay, South Africa. Several sailors can be seen clinging for their lives to the mast and the rigging as the vessel slips under the waves. Six of the crew of twelve men lost their lives when the ship was wrecked off Robben island.

Car with Rudderlike Tail Resembles Airplane

Among the new automobiles introduced recently at the Paris show is one with a rudderlike tail. The car, a Peugeot, bears a striking resemblance to an airplane. Stability at high speed is claimed as one advantage of the rear end structure.



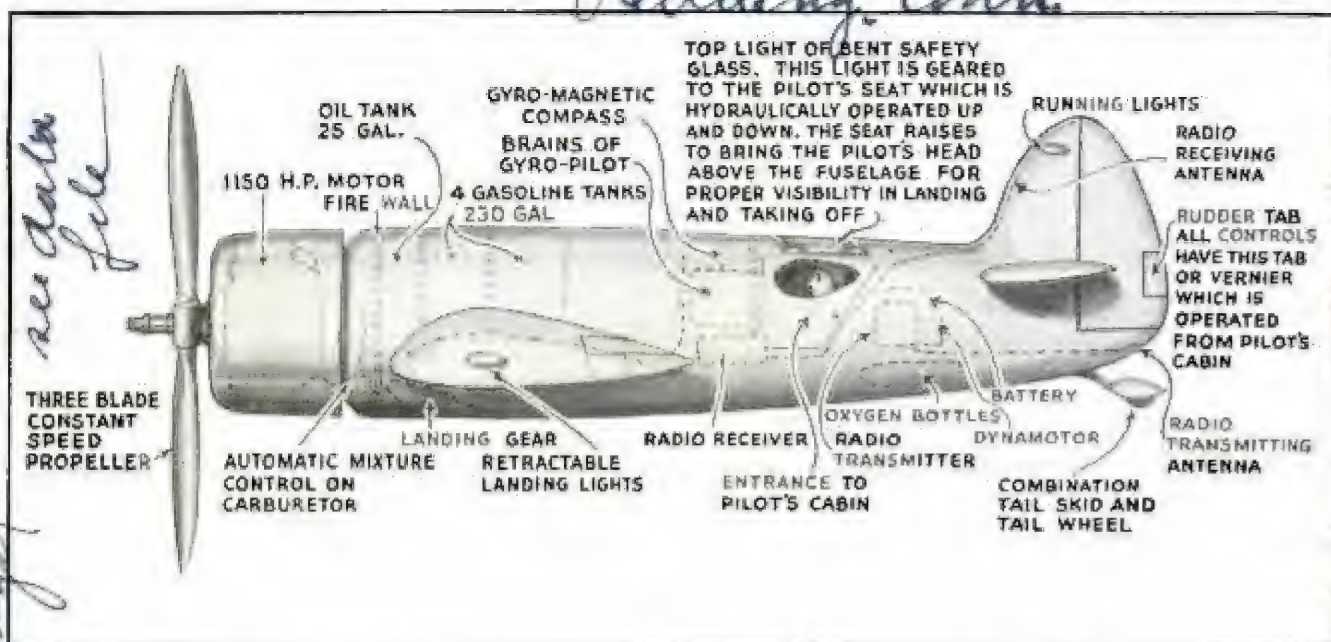
Latest streamliner in Europe has odd tail which is designed to stabilize the car at high speed

Chemicals Made from Whey Open New Field for Dairy

Whey, once a troublesome waste product of skim milk, is now being turned to profitable use in the making of lactic acid.

In the past lactic acid has been made from molasses, cornstarch and other fermentable sugar sources, but the use of surplus milk for this purpose opens a new source of income for dairymen. Whey is a by-product of the manufacture of casein from skim milk. Lactic acid is used in the textile industry, in baking, in hardening pickles, soda-fountain beverages, medicines, lacquers, and in the leather industry to neutralize lime used to remove hair from hides.

'Flying Laboratory' to Do Six Miles a Minute



Drawing of high-speed plane designed for experimental flying. Note feature which permits pilot to elevate seat to increase range of vision. The ship is equipped for altitude work

Capable of a top speed of 375 miles per hour, a racing plane designed for scientific research flying has been completed and tested. The streamline monoplane has a twenty-two foot fuselage and a thirty-one foot wing spread. It is powered by a 1,150-horsepower engine. Special wing flaps permit a landing speed of sixty-five to sixty-eight miles an hour. The pilot's seat and the top window light of the cabin can be raised to give wide visibility for landing and taking off. Once in the air, the seat and window are lowered, fitting smoothly into the fuselage and providing

perfect streamlining. Landing gear and landing lights are retractable. An aluminum duct from the leading edge of the wing supplies air for the cabin and helps to build up pressure for high-altitude flying. For substratosphere flying, oxygen tanks feed the necessary oxygen into the cabin. The ship is equipped with a super-sensitive automatic pilot which will relieve the human pilot, Capt. Frank Hawks, on distance flights. Climbing rate of the "flying laboratory" is 7,000 feet a minute at sea level. A Hamilton constant-speed propeller is driven by the powerful engine.

Vast "Balloon" Gasoline Tank Holds 100,000 Barrels



Spheroid gasoline reservoir designed to withstand heavy pressure

Built in an unusual spheroid shape to withstand the heavy pressure of its contents, a gasoline tank near Port Arthur, Tex., is so tremendous that at a rate of twenty-five tank cars a day it takes twenty days to fill it. Capacity of the tank is 100,000 barrels. Flat and circular tanks can hold a pressure of about an ounce per square inch, but this balloon-like reservoir can maintain a

1240 *h. Hornum An Chicago*
pressure of ten pounds. More than 1,000 cubic yards of concrete were poured to form its base. It is painted aluminum to reduce temperature and resultant evaporation, and a "blending spider" mixes the gasoline to a uniform consistency.

Spring Frame on Latest Bike Gives Softer Ride

F1245.
Built-in spring frame construction on the latest bicycle is designed to give a softer ride. It consists of three spring leaves installed in the rear crank hanger and two parallel bars running directly from the head in a curve to the rear axle. The other parts of the bicycle are in keeping with the sweeping lines of the spring frame, resulting in a trim, fast appearance.



Model Shows Moon's Phases as Spotlights Move

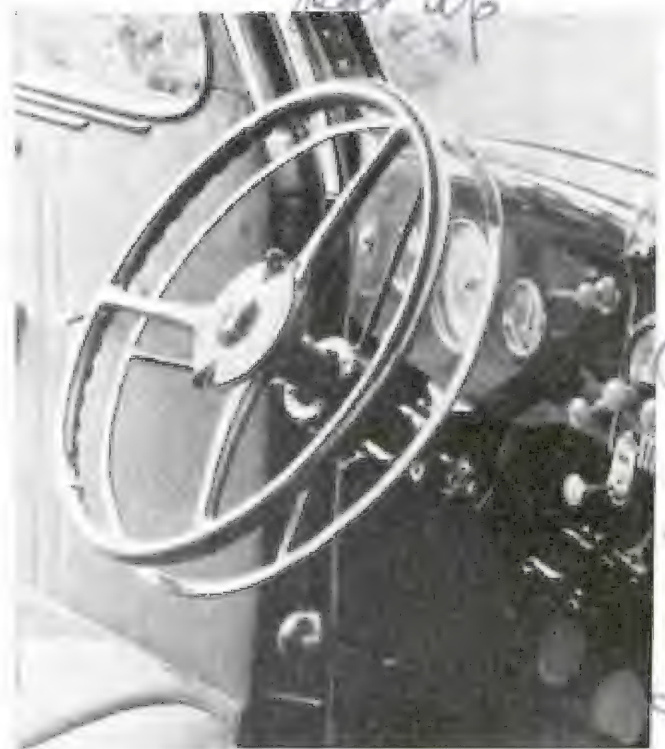
Every phase of the moon is shown on a papier-mache model as spotlights mounted on small carriages move in accordance with automatic controls installed on the lecture desk at Franklin Institute, Philadelphia. The apparatus is covered in front by a black curtain with a window cut in it and the effect is the same as when one gazes on the moon in the sky.



Model of moon with lecturer pointing out topographical feature brought out by spotlight

Cmt. Eckhardt

Auto Driven by Hands Alone Controlled by Extra Wheel



Top wheel is for steering; lower wheel slides down to engage clutch and accelerate, up to apply brakes

Driving an automobile entirely by hand is made practicable by a special control system which can be installed on any car. Fingertip pressure applied to an extra wheel mounted on the post just below the steering wheel operates brake, clutch and accelerator. Foot pedals are unnecessary, but they can be used if desired by locking out the hand control mechanism. When driving by hand, full power brakes, clutch and throttle are operated by vacuum cylinders controlled by valves, and these valves are controlled by the second wheel. This is mounted on a collar, rotating freely on the steering post and sliding up and down. About two inches below the steering wheel it is in "neutral," to which position it returns when pressure is withdrawn. Press the wheel down and the clutch is engaged, the throttle advanced and the car moves forward, accelerating as the control wheel moves downward. As the control wheel is raised, speed is reduced; in neutral position the clutch disengages and the throttle closes; above neutral, brakes are applied. If it is desired to keep the clutch engaged for braking, there is a dashboard button to lock it. The system was invented by a man who had lost the use of his legs by illness.

Stone Controls, Inc. Dec. 30, 1922

F/10 24

CUTTING CAPERS

*Correct position of partners
for waltzing on skates, and
position of feet at conclu-
sion of pivot*



the most absorbing of all the forms, but there are no short cuts to its mastery. Some skaters take a fancy to some curlicue and work at it until they can do the one stunt fairly well. If they would apply the same time to the study of the underlying principles of figure skating, they would soon be capable of doing dozens of stunts.

The essence of figure skating is embodied in forward skating, backward skating, left and right turns, skating on the outside forward edge, outside backward edge, the inside forward edge, and the inside backward edge.

The meaning of the word "edge" should first be explained. In ordinary backward or forward skating, the width of the skate blade rests flat upon the ice. Figure skating is different, however. When cutting a

By Jack Smalley

Professional, Minneapolis Arena

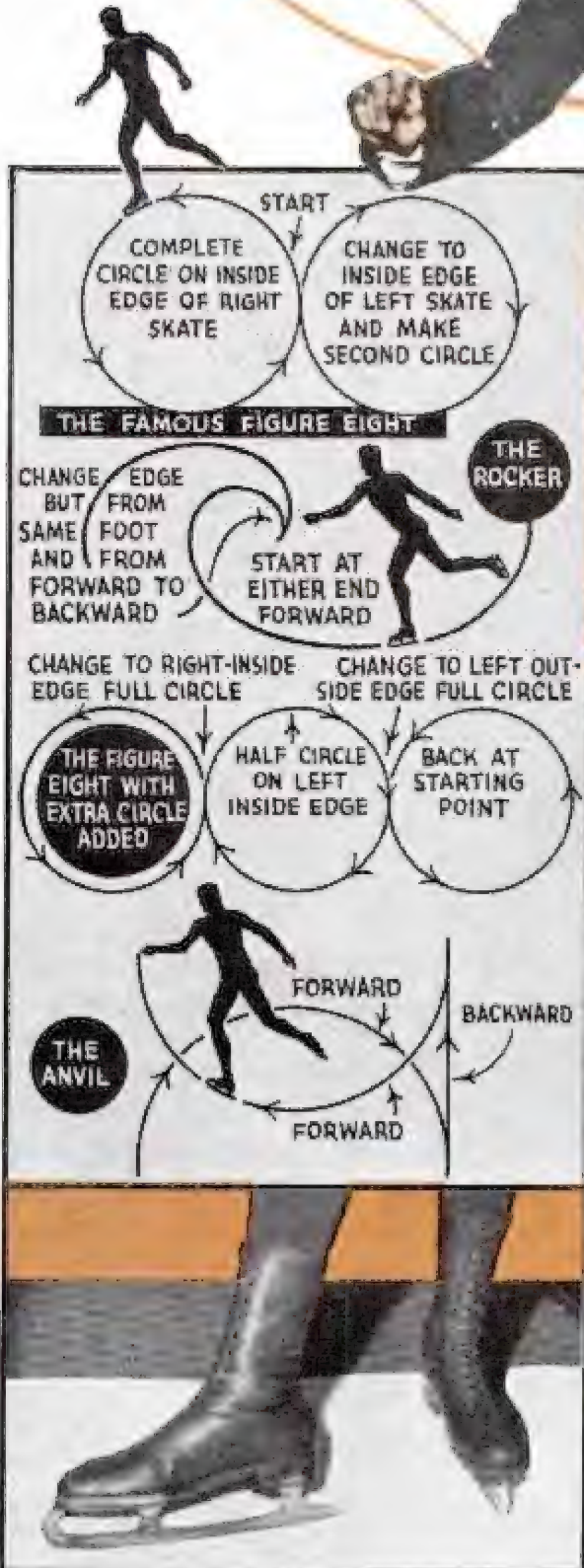
FIGURE skating is done with the mind as well as the feet. Headwork is what distinguishes a good skater from a mediocre one.

The first rule is not to go fancy until you have schooled yourself thoroughly in fundamentals. Figure skating is, perhaps,

no address change - 10/10/37

Mr. James H. ...
20 W. Hartman Road,
Kansas City, Mo

ON ICE



circle, the skater leans his body in one direction and does the same with his skate. Thus, the blade runs on an edge instead of being flat on the ice. If the body and skate weren't tilted, it would not be possible to etch figures and circles.

There are two edges on each skate, the inside edge being on the inner side of the foot and the other on the outer side. A skater going on the right foot in a curved direction to the right is on the outside edge. When gliding on the right foot in a curved direction to the left he is on the inside edge. You become a figure skater when you learn these four movements as they are virtually figures in themselves.

Diagrams showing execution of the figure "eight," the rocker, the "eight" with extra circle and the anvil. Above, right way to execute the outer forward "edge." Bottom, the "strike-off"

F 10.24

Don't attempt this stunt until you have mastered a few of the fundamentals. Below, right way to skate on the inner forward "edge"



The inside forward edge is the first to learn. You move across the ice just as in regular forward skating except that every mark on the ice is made with the inner edge of the skate. Suppose the left foot supplies the "strike-off," or the power with which the movement is made. This comes from the edge of the skate not employed in describing the circle. Remember, al-



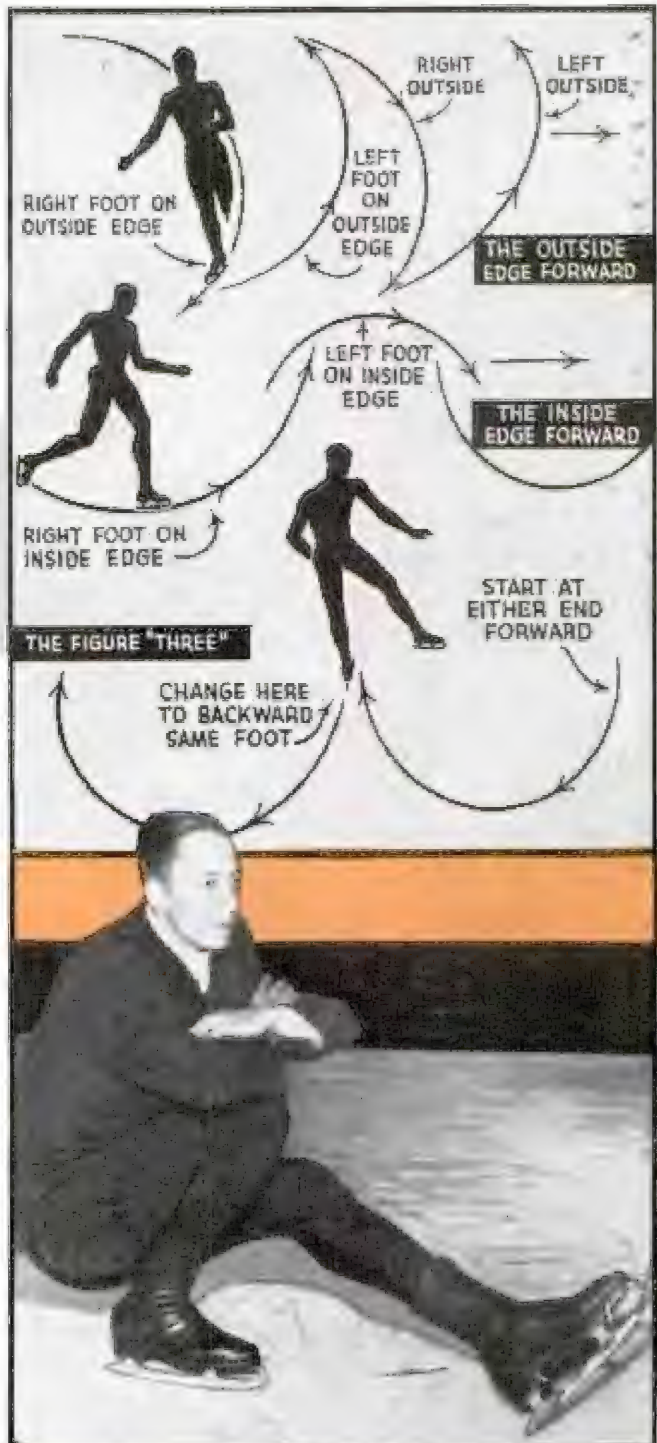
ways from the edge of the blade, not the toe. The right skate starts to cut a half circle inward toward the left and on the inside edge of the blade from the force of the strike-off. The left shoulder is brought forward, the body leans toward the inside of the circle, and the left foot is carried behind.

Gradually, you bring your left foot forward and when the half circle is completed, place it on the ice, shifting the body weight. On the left skate's inner edge another half circle is cut. It is the right shoulder that is brought forward this time.

The outside forward edge is the same in many respects except that the marking is made with the outer edge of the skate. The left foot again supplies the strike-off, and the right skate, leaning on its outer edge, starts to cut a half circle to the right. The body weight is thrown forward on a slightly bent right leg. While this is being done, the body should be leaning toward the inside of the half circle being described. This time, the right shoulder is forward and the left foot behind.



Effortless speed, one of the fascinating thrills of skating. Below, diagrams showing how outside "edge" forward, inside "edge" forward and figure "three" are executed



As the routine progresses, the left foot should be brought forward so when the half circle is completed, the weight of the body can be shifted to the left foot, this skate proceeding on its outer edge to cut another half circle off to the left. Here, of course, the position of the body and shoulders is reversed, the left side of the body leaning toward the inside of the circle with the left shoulder forward. The right foot is behind. When the second half of the circle is reached the right foot is again set on the ice and the movements are repeated. You can alternate from the right outside edge to the left outside edge as long as you wish. The same is true of the other edges. The outside and inside backward edges are executed in the same way except they are effected backward. These can be picked up by the skater who has grounded himself in the forward movements.

Faults should be corrected as soon as

(Continued to page 140A)

One nice thing about "shoot the duck" is that you don't fall so far when you do fall. Any skater can learn this simple stunt

'Baby' Racer Built as Hobby Hits a Fast Pace



Notice the clean design of this ninety-mile-an-hour racing car. Its headlights are retractable, and the exhaust vent is a narrow slot in the tail "fin"



disappear into the body, spare wheel, tools and baggage are all carried inside, and even the exhaust aperture is built in as a narrow slot in the tail "fin" that extends from the driver's seat to the back of the car. The motor is a specially built V-8 with two carburetors. Over-all length of the car is twelve feet, width fifty-nine inches and height forty-three inches, with six-inch road clearance. The filler caps for gas tank and radiator are remotely controlled.

~~#1348~~
Gas Seeps Through
Red Hot Metal
as It Expands

With a wheelbase of only eighty-six inches, a front-drive car built as a spare-time hobby by a Chicago engineer is geared for ninety-mile-an-hour speed yet achieves the economical performance of thirty miles on a gallon of gasoline. Trim and clean of design, it has no external "gadgets" to mar its appearance: hood latches and locks are concealed, headlights

Metal is not always solid. Proof of this was given by Dr. W. R. Ham of the physics department at Pennsylvania State College when he passed hydrogen gas through red hot metal plates. Metal is composed of crystals, molecules and atoms with vacant spaces between them, and as its temperature is raised the crystals change their structure. In his demonstration,

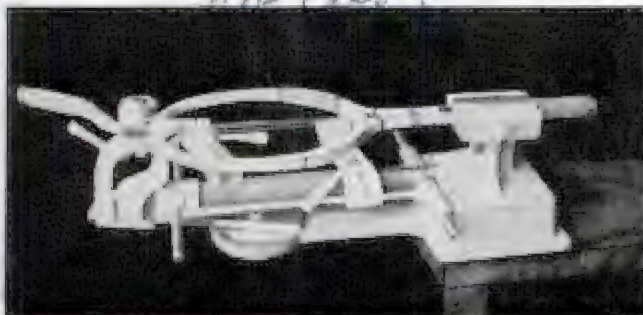
State College P.A.

Built and owned by B. J. Harris 111
224 S. Michigan Ave. Chicago

Dr. Ham heated a metal plate slowly, and at first no hydrogen went through the plate; but as it reached a critical temperature more and more hydrogen passed through the vacant spaces in the expanding metal. By studying metals in this way the scientist learns to predict the points at which changes in the physical nature of the metals occur, such as elongation, tensile strength, magnetic permeability, conductivity and crystal structure.

Racket Restringer Keeps Tension Uniform

Stringing tennis rackets with an automatic tensionizing stringer which uses no awls saves the gut and frame from bruising and strain. The tensionizer is set by turning an indicator to the number of pounds tension desired, and thus both lateral and cross strings are uniformly taut. A multiple disk clutch prevents pulling the strings tighter than the set tension. One turn of the gut on a special rubber-covered drum of the tensionizer pulls it to the maximum tension.



Racket is strung equally taut in both directions

Million Volts for X-Ray Tube Flow from Giant Generator



To develop curative rays which will penetrate deep into the human body, electrostatic generator will supply a million volts for X-ray tube

Rays more penetrating than all the radium in the world are to be developed in a huge X-ray tube designed for a Boston hospital. To supply the power for this tube, a million-volt electrostatic generator has been built. Medical authorities hope that when this electric plant begins its beneficent work, the X-rays will have a curative influence on malignant growths in the human body so deep-seated that treatment has hitherto been impossible.

Model makers are being offered a kit of gold leaf with tools for applying it.

Hastings & Co.
210 N. Main St.
Boston, Mass.

Mass. Institute of Technology
F1297
commercial type
chid
tensioning
no. 12

Tropical 'Delicious Monster' Is New Fruit for Your Table



Conelike, the ceriman bears luscious, meaty kernels, seen on the table in foreground. It looks like a cross between banana and pineapple

Like a banana in shape, like a pineapple in external markings, and a little like both in flavor, the "delicious monster" from the tropics is being introduced to North American tables. Despite its resemblance to these fruits, the ceriman, or *Monstera deliciosa* as botanists know it, is not a close relative of either banana or pineapple. A native of Central America and Mexico, and grown now in Florida, it is borne on a large-leaved climbing plant. When the cone-like fruit ripens, the small hexagonal sections of the rind burst off and reveal kernels of white meat somewhat like an ear of corn, delicious in flavor.

Lifelike Movie Colors Seen by Engineers

Motion-picture engineers, in a recent convention, predicted that color, brilliantly true to life, will be the next widespread change in the film industry. The engineers said that the day is not far off when theatrical talkies will use color film almost entirely. They pointed to the recent development of amateur color film that in about one year has made black-and-white movies virtually obsolete. The difficulty in applying the same process to the theater is that it

has not become possible to make prints by the color process most widely used for home movies. More color in professional pictures is forecast by reports that the lenticular type of color film is adaptable to larger theater projection. Present color movies are produced by a more complicated and costly method which has prevented wider use.

Dental Trailer Serves Needy of State

Dental equipment of the latest design has been installed in a trailer which the state of Indiana will send out to treat needy children. The trailer contains one dental chair, a divan, hot and cold running water, sterilizer and other apparatus. Services include prophylaxis, cement and amalgam fillings, and extractions.



Interior of the dental-office trailer which will serve needy children in all parts of Indiana

Pigeons Speed Story and Film to City Papers

When minutes count in getting stories and photographic film back to the newspaper office, reporters save time by using carrier pigeons instead of a human messenger who may be delayed by heavy traffic in city streets. Recently one New York publication and a photo service syndicate inaugurated the carrier pigeon means of delivering material to the home office, thereby scoring a "beat" over rival reporters and cameramen using motorcycles and automobiles. Cameramen use a portable darkroom or lightproof changing bag to unload the film into an aluminum capsule in broad daylight. After being sealed, the capsule is taped to the pigeon's leg and the bird is released, to wing its way straight to the newspaper office. Important stories are written on very thin paper and sent in the same way. From one to three hours may be saved on assignments in and near New York. The pigeons proved successful for transmission of film and copy when the liners "Queen Mary" and "Normandie" arrived.



Reporter ready to release carrier pigeon with pictures and news story. Inset, capsule containing film is attached to bird's leg

Weather-Resistant Bricks Made of Acidproof Cement



Samples of acidproof bricks which are impervious to effects of weather

Sulphuric cement manufactured in blocks which must be melted for use is the basis of a construction material which promises long life. Bricks made with this cement are impervious to weather and resist attacks by acid and gases found in chemical plants, tunnels and sewers.

Radio Peers into Human Body Taking Picture without Light

Photography of human tissues and organs by radio waves instead of X-ray or visible light is being developed in a California laboratory. The method is based on the theory that heart, lungs, brain, muscles all have their individual electromagnetic vibrations. A radio receiving set is tuned to receive the emanations from the muscle or organ and a small wire connected to the set is touched to the body over the tissue for a short period. The wave received is amplified and sent through a photo-electric cell, then transmitted to photographic film.

D DOCKING



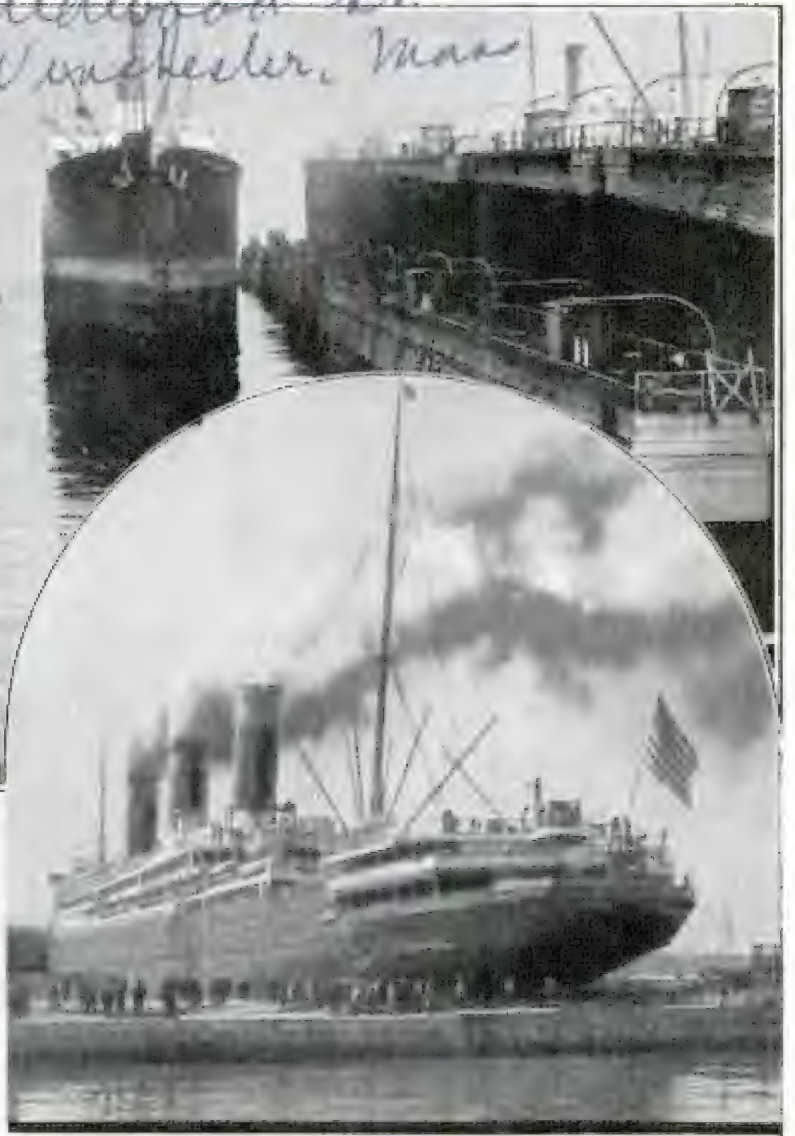
The size of a modern dock is indicated by this photograph showing two destroyers docked side by side at a navy yard

By Commander W. Mack Angas

WHEN a big ship is planned, her designer must consider the problem of getting her out of the water, even before taking up the difficult and often critical problem of getting her into it.

Steel ships require dry-docking at regular intervals of from six to twelve months for the cleaning and painting of the bottom plating and routine repairs. Dry-dock design and construction must, therefore,

Commander, Corps of Engineers U.S.N.
29 Wildwood St.
Worcester, Mass.
the BIG FELLOWS

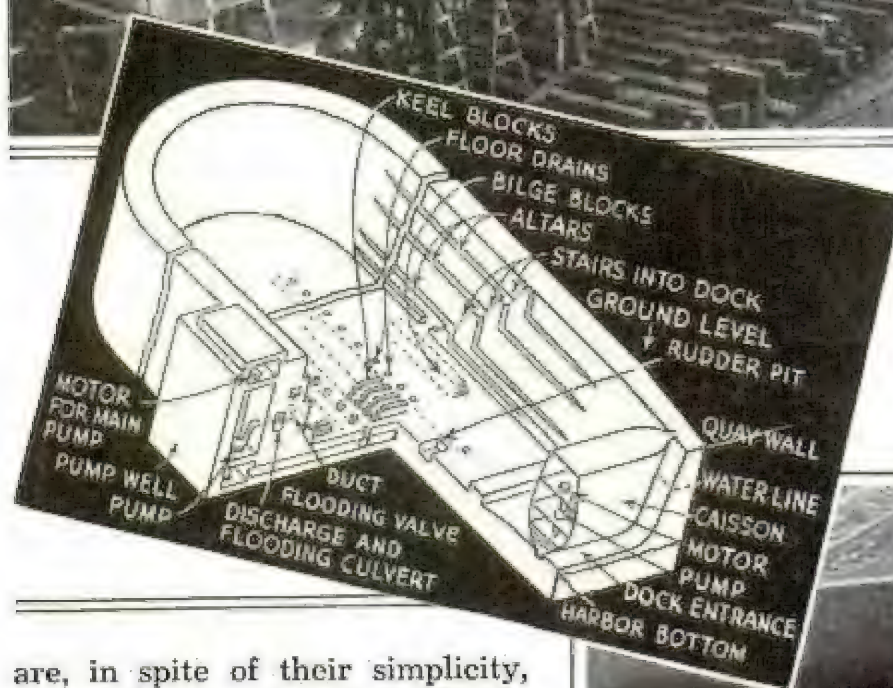


keep ahead of ship building. The size of the great ships of today is in general limited by the size of the dry docks of yesterday. The civil engineer of today is, therefore, estimating the size of the ships of tomorrow and designing and building dry docks to accommodate them.

Although dry docks are among our largest engineering structures, they attract little attention despite their vital necessity to the ocean transport system of the age of steel and steam, largely due to invariably being located in some out-of-the-way shipyard not open to the general public and also because the docking of a ship is far less spectacular than the launching of the same vessel.

But to lovers of ships there is a fascination about seeing a great vessel out of her usual element, with the beautiful symmetry of her hull and the great bronze propellers which drive her exposed to view. The methods used to get the floating cities out of the water

Top, ship entering floating dock. Center, docking the "Leviathan." Bottom, ship in floating dock



are, in spite of their simplicity, among the more ingenious developments of science and industry. Two basic methods are used. These are taking the water away from the ship in a graving dock or lifting the ship bodily out of the water in a floating dock.

A graving dock, a basin into which a ship can be floated, and from which the water may subsequently be pumped, is a logical development of the crude methods used to make underwater repairs to the first boats and ships too large to be drawn out of the water by man power or draft animals. It was usual to run such vessels ashore at high tide on a clean sandy beach, careening them onto one side as the tide fell and doing such underwater work as was

possible before the next high tide refloated the ship. The operation was usually repeated to get at the other side of the hull.

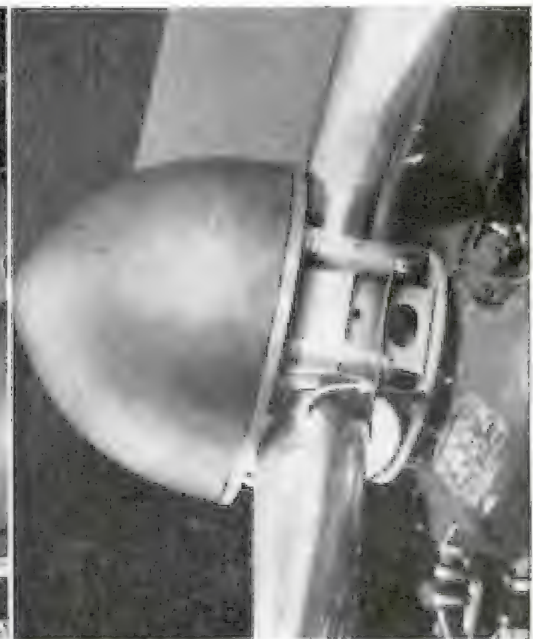
To improve the accessibility of careened vessels the "gridiron" was developed. This was merely a heavy timber platform upon which the receding tide left the vessel. The gridiron greatly increased the accessibility of the ship's bottom, but did nothing to extend the short interval between tides which was available for underwater work. When extensive underwater repairs became necessary, it was a natural step in the evolution of the dry dock to build a dike around a gridiron, and after the ship was deposited on it

(Continued to page 120A)



Top, docking a dry-dock caisson for repairs. Center, diagram of graving dock. Below, stern of the "Leviathan" in dock where the vessel is being repaired

De-Icers Protect Air Liners on Winter Flights



Left, three views of rubber overshoes attached to edge of wing, fin and stabilizer. Right, propeller guarded by cone-shaped spinner and by ring which distributes oil on blades to prevent ice formation



For protection against excessive accumulation of ice on transport planes de-icing equipment is installed with the approach of winter. Transcontinental and Western Air, Inc., uses rubber overshoes on the leading edges of wings, fin and stabilizer; spinners and oil slinger rings on the propeller, and pull cords on the radio antenna. The overshoes are made of rub-

ber sheeting into which are built three tubes. Inflating the tubes results in a violent breaking action on ice adhering to that particular part of the plane. By keeping the leading edge free, the possibility of ice forming over the balance of the plane's surface is minimized. The pull cord on the radio antenna shakes free any ice accumulated on wire and insulators when pulled and released. The oil slinger ring is attached to the back of the propeller hub. Special glycerin solution is fed from the interior of the plane to a groove in the ring, which in turn distributes it over the entire propeller blade area by centrifugal force. The solution prevents ice formation but does not interfere with performance of the propeller.

The spinner is a cone-shaped attachment made of metal and coated with rubber. Bolted to the front side of the propeller hub, it protects the adjustable mechanism of the variable pitch hub which is not guarded by the oil slinger. Before the transport leaves the ground, the spinner surface is coated with castor oil which prevents adhesion of ice.

B. F. Goodrich Rubber Co.

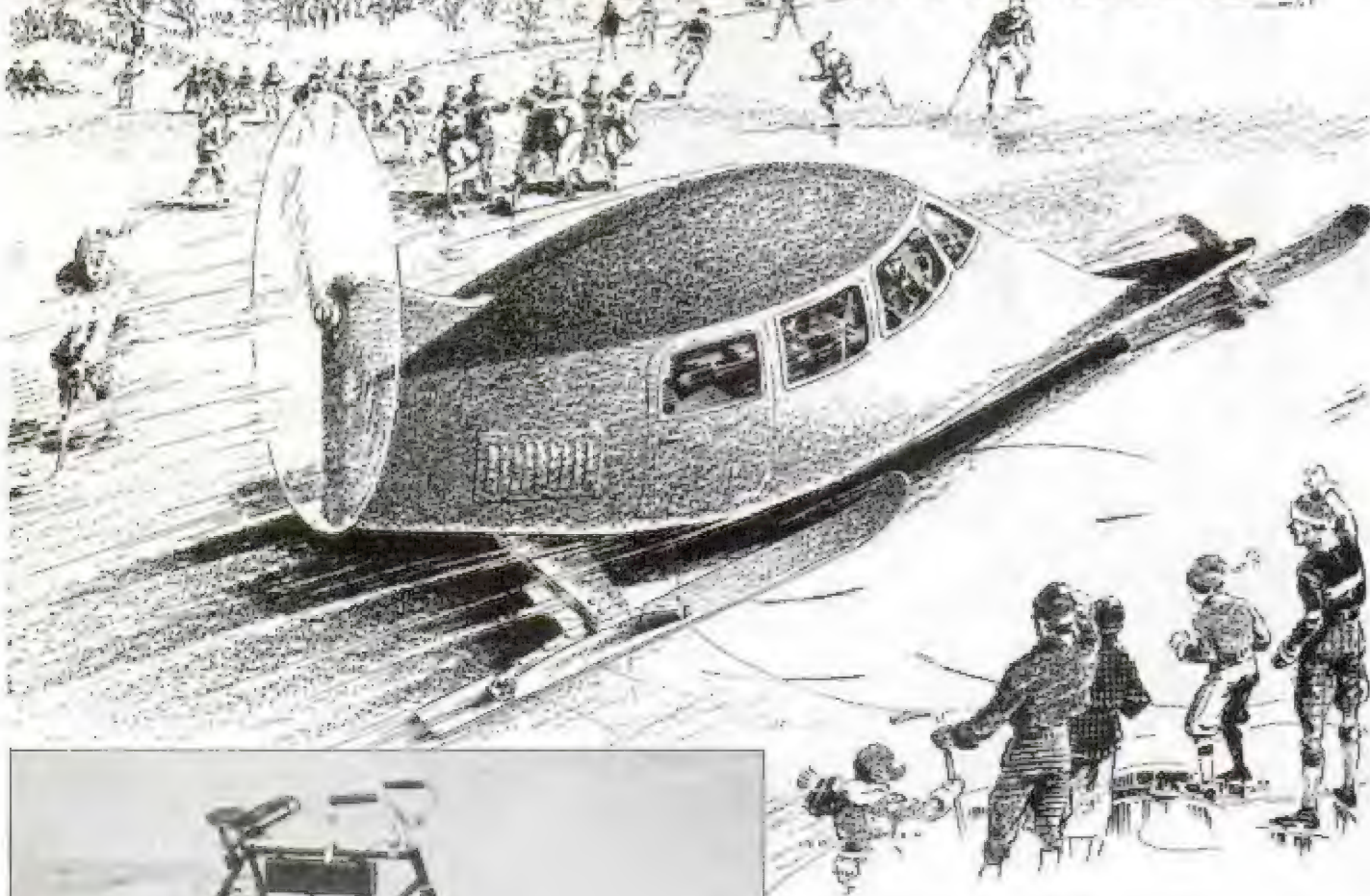
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Chicago

MOTORING on SKIS



Top, drawing of the snow sedan as it would appear on winter sports course. Center, the "bronco," a motor bike equipped with tractor tread at rear and runner at front. Bottom, driver's compartment of the speedy power sled which is capable of 150 miles per hour on ice. Its steering wheel controls the front runner



By T. E. Mead

ROARING like an airplane and moving so fast that it is hardly more than a blur against the blue-white of ice and snow, a strange-looking craft speeds along the surface of a frozen lake near the Illinois-Wisconsin line. Down a course marked by tiny flags it races, then makes a sweeping turn at the far end as the driver throttles the engine. A final burst from the motor is followed quickly by silence as the ignition is cut off and it comes gliding to a stop.

Spectators hurry from shore to get a closer view. They see what appears to be the body of a carefully streamlined racing car or the cockpit of an airplane, mounted on three skis, one in front and two attached to wing-like outriggers on either side.

winter's latest sport



Almost a foot wide and shod with steel blades like ice skates, the runners give a sure footing on ice and hard-packed or loose snow. Just ahead of the single-seat driving compartment is the power plant, a forty-horsepower aircraft engine which drives a two-blade propeller mounted in the nose.

Capable of 140 to 150 miles per hour on smooth ice and 100 on hard-packed snow, this racing sled's full speed has never been reached, the driver tells us, because a sufficiently long, clear course has not been available. Only for a few seconds at a time has it been possible to apply all the power and that on a marked course surveyed in advance.

Bumps and depressions, though ever so small, in the ice and snow tend to upset the balance of the plane-on-skis at high speed, so the driver carefully picks his road when he wants to "open 'er up." But at slower pace, the craft rides easily and sure-footedly and can travel over almost any surface coated with ice or snow. The rougher the road, the slower the speed, of course.

Flaps built into the sides of the body help to stop the sled. Except at unusually high speeds, the flaps can be opened from the driving compartment to act as air-resistance brakes. An attractive instrument panel is equipped with ta-



Top, power sleds on the line for fast jaunt down the frozen lake. Bottom, closeup of the super-sled

(Continued to page 118A)

Alaska Street Car Has "Mummy" Conductor



Built of odd parts by a sixty-seven-year-old Alaskan sourdough, a street car riding on a six-wheel motor-truck chassis rambles through the streets of Skagway with a "mummy" conductor on its rear platform. Martin Itjen, builder and driver, equipped his thirty-five passenger conveyance with a collection of picturesque attachments: a stuffed brown bear cub that rides in a front seat and flashes its electric eyes and opens its jaws when the driver presses the horn; a blue-



Top, left, image of "bad man" salutes passengers of odd street car. Right, driver beside car. Bottom, stuffed bear in driving compartment

uniformed image of "Soapy" Smith, pioneer Alaskan bad man, which stands on the open platform raising the right arm in salute to tourists. The bear also grasps a cord, ringing the gong when the car approaches a crossing. Stuffed arms drop down to indicate left or right turn. Brass rails from "Soapy's" old tavern

provide a handhold for passengers stepping aboard. The car is twenty-four feet long and six feet wide and is mounted on a standard truck with two extra wheels.

Plane Uses a Rail Handcar for Its Runway in Takeoff



After run of 400 feet the plane takes off from the handcar. The plane's propeller drives handcar until the takeoff

Riding a handcar seems a novel method of catapulting a plane into the air. A test pilot at San Diego, Calif., proved it ~~could be done safely~~. His biplane was mounted on a railway handcar rebuilt for the purpose, the plane wheels in a groove to prevent the ship sliding off. A supporting frame under the fuselage held the plane level for flight when the proper speed

was attained. The plane's propeller started handcar and ship rolling down a straight stretch of track near the airport, gathered speed, and after a four-hundred-foot ride on the rails the pilot flipped the plane up into the air and zoomed away.

F12 48

Small Generator on Wheels Works for Farmer

Handy for operating machines which will clip hedges, mow grass, shear sheep, saw wood, light the house and do many other jobs, a generator mounted on rubber-tired wheels produces 110-volt electric current for the farmer or camper. The 400-watt dynamo is driven by a one-cylinder gasoline engine which runs eight hours at full load on one gallon of fuel. The generator is driven directly off the engine by means of a flexible coupling. An automatic electric governor controls the speed and output of the generator. If desired the engine can be used alone.



Small portable generator and motor being used to drive electric hedge clippers. The equipment has many other uses

Wooden Horses Pull Coach in Museum of Frontier West



Museum setting in which wooden horses are shown harnessed to stagecoach of the Old West, preserving memories of frontier days

Wooden horses, like wooden Indians, are fast becoming extinct, but four of the artificial steeds have been saved for coming generations by joining a museum of relics in California. These equine "models" once displayed the latest style in harness. Now, in a frontier west setting, they display the ancient style of travel, being harnessed to a stage coach on a street of the "pony express" museum in Arcadia.

There is no "zero" year on our calendar, the year 1 A. D. having begun at the close of 1 B. C.

W. Parker Lynn, Arcadia, Calif.

Scenic, mythical

No. 11 of same

The San Francisco Chronicle

GOLD FARMERS



Relics recovered from old gold diggings being reworked today. Above, gold miner of today operating a sluice box

IN SOME parts of the west gold "grows" like any ordinary vegetable and men operate gold farms on which they dig up regular crops of the yellow metal. The gold farmers don't worry about fertilizing or irrigating and it's not even necessary to plant new seed each spring. In this strange agriculture they merely wait until the right time of year and then harvest a crop which they can exchange for dollar bills at the nearest assay office.

These lucky men own canyons located below districts rich in gold. Each season rain and snow water wash some of the gold down out of the hills, concentrate it, and deposit it in natural traps in the can-

yons. Then the gold farmers come along to harvest their crop.

"Typical of the gold farms is a small canyon north of Tonopah," says Roy L. Cornell, Los Angeles mining engineer. "The slopes of the hills beyond contain many small stringers of ore that carry gold but none are large enough to make mining them worth-while. So the owners simply sit back and let nature do the milling and concentrating. Each winter and spring the heavy rains sweep down some of the ore, grind it up, and drop the concentrates on the floor of the narrow canyon.

"The lighter sands and dirt are swept

of the WEST



Top, placing burlap sack in sluice box, shaft leading to gravel bed rich in gold, and sluice box which traps gold in gravel

away by the floods but the heavy particles of gold are left behind in a natural sluice box about 400 yards long on the floor of the canyon. That's where the crop is harvested. The owners gather \$500 or \$600 worth of gold every year in exchange for two weeks work or less. But don't expect to find a bonanza farm for yourself. There are not many places where large amounts of gold can be harvested every year and all known locations have been taken up."

Almost every stream in the gold country, however, produces gold in small quan-



Giant gold dredge and sample of black ocean sand from which gold is obtained



tities. When the forty-niners first worked these streams they recovered large amounts of heavy nuggets and coarse dust that had been accumulating for centuries. Later, the Chinese reworked the same gravel and gleaned quantities of fine gold the original prospectors overlooked. Since then the streams have started the accumulation process all over but there will never be another tremendous crop of coarse gold because no one wants to wait a dozen centuries for it. Instead, itinerant prospectors are continually hunting for small deposits of flake gold that have concentrated since the streams were last worked. Sometimes the same prospector works the same stream each spring, skimming off a thin layer of pay dirt deposited at the places where the current slows down and allows the fine gold to drop to the bottom.

In a depression thousands of unskilled miners gather along the streams, many of which have not been worked since the last

depression. The amounts of gold recovered are not great but the streams can be depended upon to supply some gold for centuries to come. In nearly any part of the Mother Lode country in California a miner with a gold pan or sluice box can count on earning a dollar or two a day, with the chance that he might happen to uncover a pocket of richer gravel or even stumble across a stratum of original stream bed overlooked by the first miners.

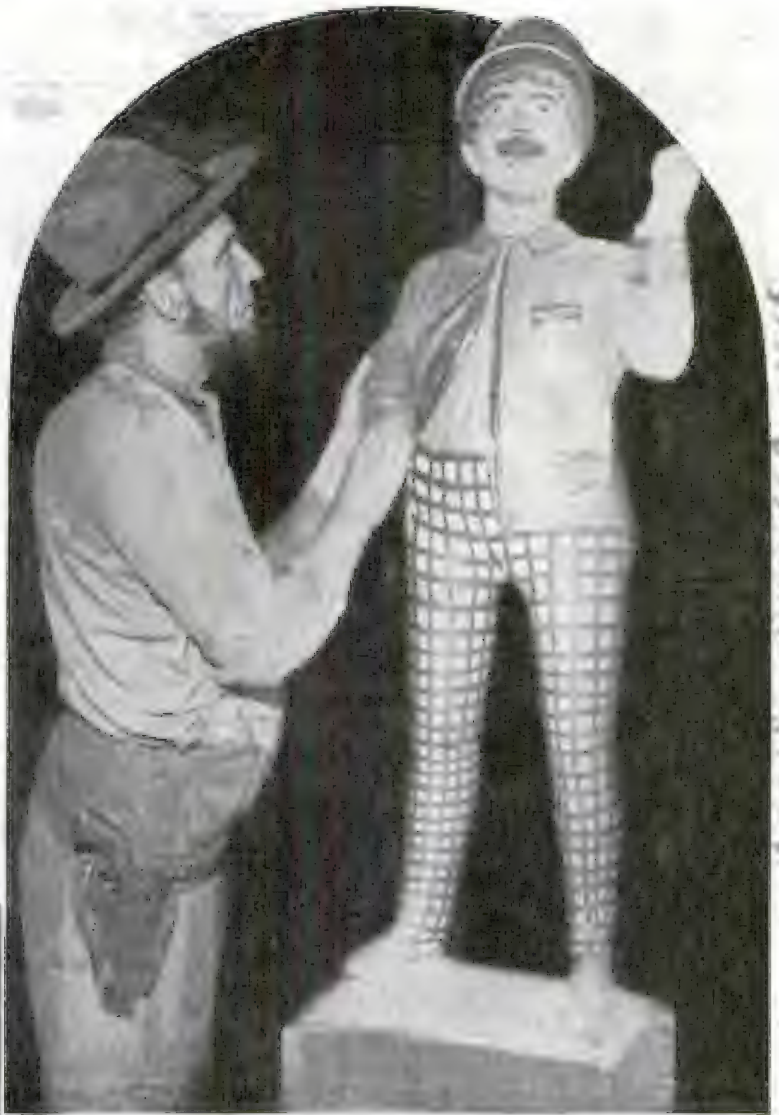
Occasionally modern miners find real gold pieces in their sluice boxes instead of the thin yellow flakes they are looking for. One miner found four \$20 gold pieces and other coins worth \$170 one day in his regular "cleanup." The coins were dated 1875 and probably had been lost or buried by



Gold scales of early days, samples of real gold, "fool's gold" and "cat" gold, and placing sample of gold in the assay furnace

some early miner who had worked the same district. Another miner was surprised to find nearly a pint of brass Chinese coins, some jade jewelry, and a powder horn in the dirt. Old American and Chinese coins are found nearly every month in the diggings being reworked. In some parts of California a gold pan is a regular item in a trout fisherman's outfit. In the middle of the day when fishing is poor he pans for gold and sometimes recovers enough to pay for the day's outing.

Along some ocean beaches of northern California and southern Oregon, gold is a regular winter crop. After a big storm or an unusually high tide the beaches may be crowded with people shoveling over a top layer of black sand cast up by the sea. They gather as much as possible before the next high tide carries the deposit back to sea. The layer may be one-half to six inches thick. After it is carried above high-tide line, sluice boxes are built, water is pumped from the ocean, and the black sand is run through the sluices. Fine gold in varying quantities is recovered by this



method. Ordinary white beach sand contains little gold and it is only when a rich deposit is swept up on the beach that the gold harvesters go to work.

For hundreds of centuries, small amounts of gold in near-by hills and mountains have been scoured out by the streams. Some of the finest material was carried to sea

(Continued to page 116A)



Left, high-temperature furnace which melts gold dust. Top, sign found in California "ghost town." Bottom, gold wet-washing outfit

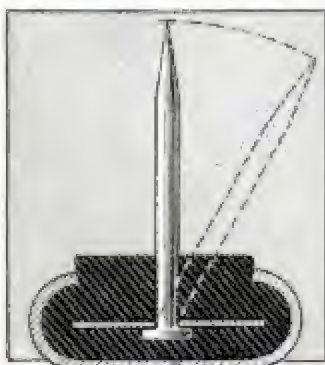
Operator Takes a Shower in Spray of Electric Sparks



Here is a photograph of what happens when you connect two arcs. The demonstrator seems not to mind the electric shower

For a dry shower bath, try electric arcs. An electrical demonstrator, well protected by goggles and gloves, showed how it was done by contacting two arcs, the resultant spray of sparks enveloping him like a shower of light. The power for the display flowed from Boulder dam generators.

Noiseless Furniture-Leg Tips Also Save Floor Wear



Desirable for use on light furniture, such as school and restaurant chairs, stools, small tables and radio cabinets, noiseless tips or glides for attaching to the legs of

the furniture are on the market. The tips absorb noise on hard floorings and reduce floor wear. Use of the glides on metal furniture is recommended by the makers because of the noise caused by moving this type of furniture. One model of the glide has a sharp nail with which the device may be attached to the furniture by a few blows of a hammer. For metal furniture, the glide is furnished with a threaded stem.

Vacuum-Pump Canning Prevents Spoilage

Food canned by a new vacuum-pump method will remain fresh in its container for years, due to the exhaustion of air from the container. Bacteria which cause fermentation, spoilage and decay cannot exist in the vacuum created by a few strokes of the pump. After cherries, pickles, jam, jelly, meat or any other foods have been placed in the jar by the cold pack or other method, a rubber ring is inserted in a metal top placed over the mouth of the jar. Next a small rubber cap is placed over a hole in the metal top and the vacuum pump's mouth is set over the rubber cap. A few strokes of the plunger extract the air and the pump is removed, leaving the rubber cap firmly



Equipment for vacuum canning, including pump, rubber band, metal top and tiny rubber seal

sealing the jar. Pressure of the outside air holds the cap against the hole. The cap seal can be removed by lifting one edge with the fingernail, permitting air to rush in and then the metal top can be taken off for removal of the jar's contents. If desired, the jar can be resealed after part of the food has been taken out, and there is no danger of spoilage after the second sealing. Fresh food can be preserved for many days in the same manner, without refrigeration, thus solving the problem of keeping leftovers, milk, butter, cream, the baby's food and even coffee and tobacco. All may be kept fresh by vacuum.

Three-Wheel Teardrop Car Has Engine Mounted at Rear



Here is the latest version of the streamline auto. Seats are located forward, with engine in rear compartment

Bus Carries Baby's Buggy on Hooks at Rear

Motor coaches in Australia have been equipped with hooks at the rear for transporting baby carriages, thus solving an old problem. The perambulator is hung on one of the hooks by its handle while mother and baby board the bus, ready for long or short trip.



This is how Australian bus companies solved problem of where to carry baby's buggy

Passengers ride in front, engine in the rear of a "teardrop" car built by a Los Angeles engineer. It is a three-wheeled automobile for three passengers, who enter doors opening above the forward wheels and sit in pigskin-covered seats with chromium trimmings. All three wheels have hydraulic brakes. The car is powered by an eight-cylinder motor.

Lost City Soon to Vanish Again Beneath Boulder Dam Lake

Nevada's Lost City, discovered after perhaps fifteen centuries of oblivion, soon will vanish again—this time beneath the waters of the man-made lake behind Boulder dam. Archaeologists already have recovered many relics of pottery, shell and turquoise ornaments, broken clay dolls, paints, arrow and spear points from the Pueblo Indian city that flourished about 1,500 years ago. They are still working against time to study this early American culture before the rising lake engulfs the ruins, which extend nearly five miles along the Muddy river. Sand dunes covered the ancient city until twentieth century archaeological explorers dug into it.

Patient in Goggles and Headset Given Short-Wave Therapy



With her eyes protected by goggles, the patient dons ear pieces for electrical treatment

Weird masks are worn by patients undergoing electrical treatment for their ills. A headset resembling radio earphones is worn when heat therapy is administered, but instead of being a radio receiver the ear pieces contain electrodes which radiate heat energy. Goggles must be worn when the patient is placed under the quartz mercury ultraviolet lamp.

Persian Lambs for Fur Market Raised on American Farms

American farmers may soon be producing the broadtail, Persian lamb and caracul furs for which the American fur trade paid more than \$2,000,000 last year. All three furs come from the Karakul sheep, chiefly raised in soviet Russia, southwest Africa and Roumania. Only a few pure-bred Karakul sheep have been brought to America from their native home in central Asia, and further importations are practically impossible due to quarantine regulations. Instead, the government is experimenting in crossbreeding Karakul rams with Blackface Highland ewes from Scotland and Corriedale ewes from New

Zealand. It is hoped that a valuable fur stock which could be supplied to American farmers will be produced. Broadtail, most valuable of the three, is taken from prematurely born Karakul lambs and is a flat, lustrous, light fur with water-wave pattern; Persian lamb, taken from Karakul lambs three to ten days old, has a tight curl; Caracul is the trade name for the wavy, moire fur taken from Karakul lambs about two weeks old.

Editing Movie Film Simplified by Pigeon-Hole Sorting Case

Chaos and confusion in the editing of amateur movie film are reduced to neatness and order by a pigeon-hole sorting case recently devised. Transposition of scenes in a long reel of eight or sixteen millimeter film becomes systematic and simple. The case consists of two trays, hinged but detachable, divided by partitions into five horizontal compartments in which eighty different strips of film can be filed in orderly fashion in small boxes. The film in each box is plainly identified by notation on blanks which fit in the box. These boxes are readily moved from one position to another in the trays, facilitating the editing of film in desired sequence. Once arranged in order, it is easy to splice the entire series together. Further, the work may be laid aside at any time and picked up later, still in order. A flexible rubber spool is supplied with the case to wind the film strips into short rolls for disposition in the sorting boxes. The case accommodates 800 feet of film.



This pigeon-hole sorting case is handy for the amateur editing movie film



TELEVISION SYSTEM of Advanced Design

AFTER eight years of experimenting, the Philco Radio and Television Corporation recently have demonstrated their television apparatus. While this system uses principles that have been the basis of research work of the two pioneers in the electronic television field, their engineers claim to have developed them into instruments of a high degree of per-

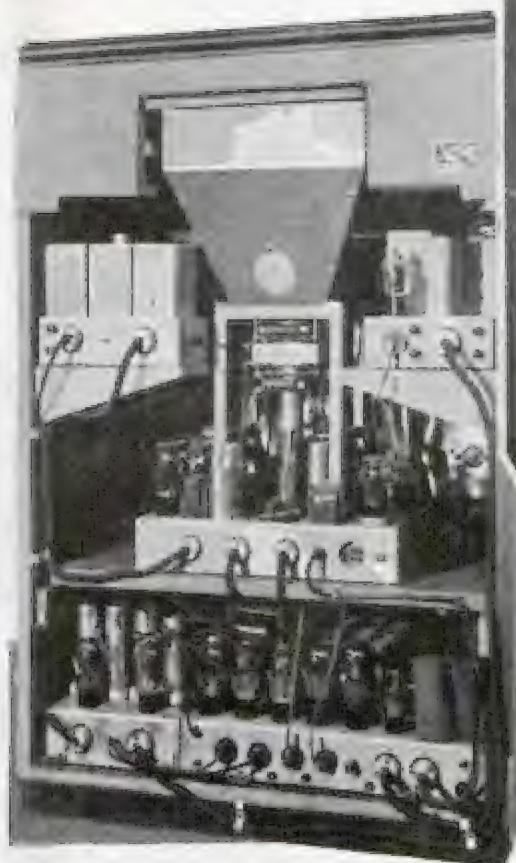


fection. The pick-up camera, shown above, uses a tube known as the "electric eye"; the extremely feeble television signal is amplified about 10,000 times in the control room until it has sufficient strength to modulate the ultrahigh-frequency transmitter.

A cathode-ray tube, 19 in. long and 12 in. in diameter, is employed in the receiver console, front and rear views of which are given. This tube is mounted in the cabinet in a vertical position, hence the moving

images appear on a mirror set in the half-opened lid of the console. This picture is about 8 by 10 in. and has sharp definition with good contrast.

All power-supply units are located in the bottom of the cabinet. The total number of tubes used in this combined sight and sound receiver is thirty-six.



SIX-TUBE A.C.-D.C.

long and



By F. M. Lund

HERE is a dual-band a.c.-d.c. superheterodyne receiver that can be built with few tools. Excellent results have been obtained with this original model which can be duplicated by any careful experimenter at low cost.

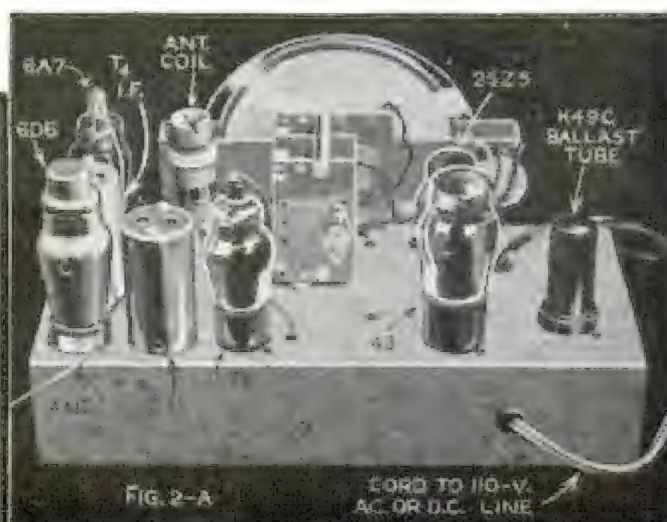
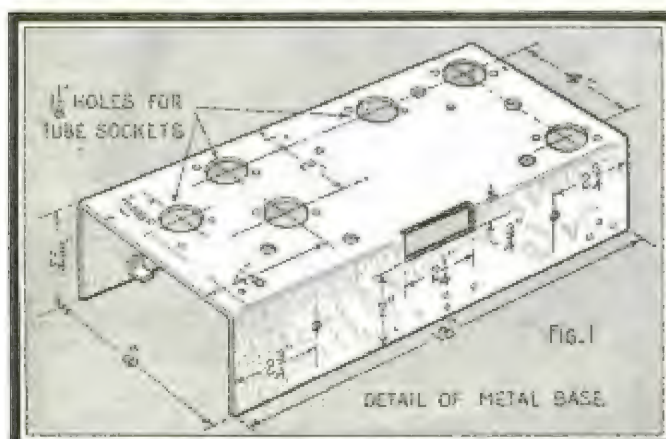
It includes a number of features that make it of special interest to all members of the family. Operating on either direct or alternating current, it covers the regular program band and all police broadcasts. In addition, it gets ships at sea,

exciting airplane calls, amateurs, and foreign reception in the 49-meter band, which is the best night band for foreign stations. It can be installed in a small mantel-type cabinet, or used to replace an obsolete receiver in a console.

A ballast tube is used to eliminate the line-cord resistor commonly employed in a.c.-d.c. sets; it also protects the tubes from overloads. In common with all good superheterodyne receivers, this one is sensitive and selective. Automatic volume control and tone control are, of course, included in the circuit. Although the parts are not expensive, they are of good quality, therefore, in order to obtain maximum results, the builder should insist that they be exactly as specified.

The large 6-in. airplane-type dial used in the model, is calibrated in kilocycles and megacycles. This dial costs about \$1.75 but it is complete with bracket and two pilot-lamp sockets.

A detailed sketch of the sheet-metal base is given in Fig. 1. This base is available, formed and drilled, if you do not wish to make your own. Fig. 2 shows the simplified wiring diagram, with the parts in their relative positions and each lead carefully indicated to avoid errors in wiring. Photos, Figs. 2-A, 2-B, 2-C and 2-D,



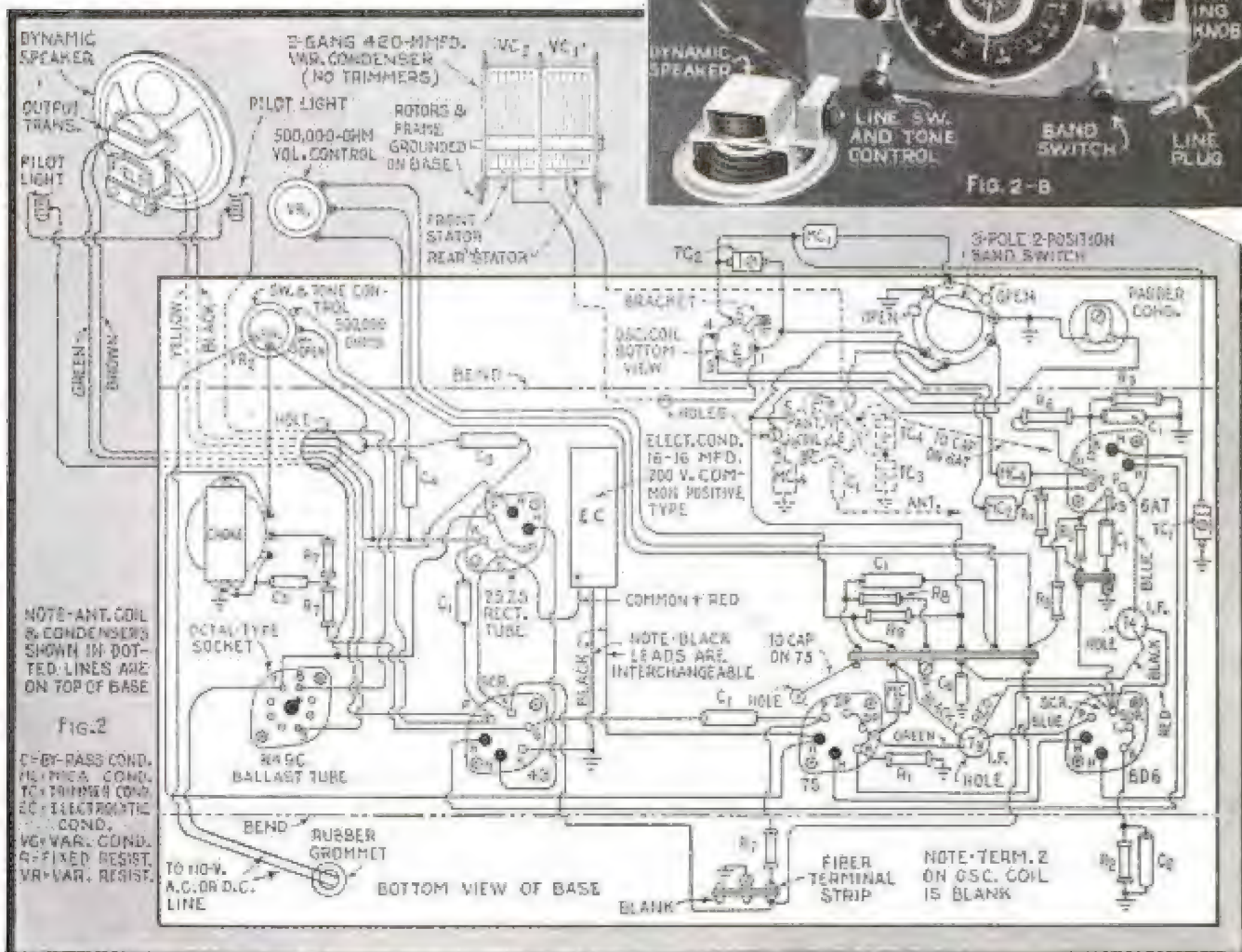
SUPER for *short waves*

show the completed set from various angles, each part being labeled to aid the builder. A schematic circuit diagram appears in Fig. 3. Although you may prefer the simplified diagram for wiring the set, it is a good idea to check each lead with the schematic diagram as you proceed. Key letters and numbers identify the same parts in both diagrams. A complete list of the original parts used, and detailed balancing data, can be obtained

(Continued to page 136A)



FIG. 2-6



How to Build a Five-Meter Pocket Receiver

By H. T. Sagert—W9BEF

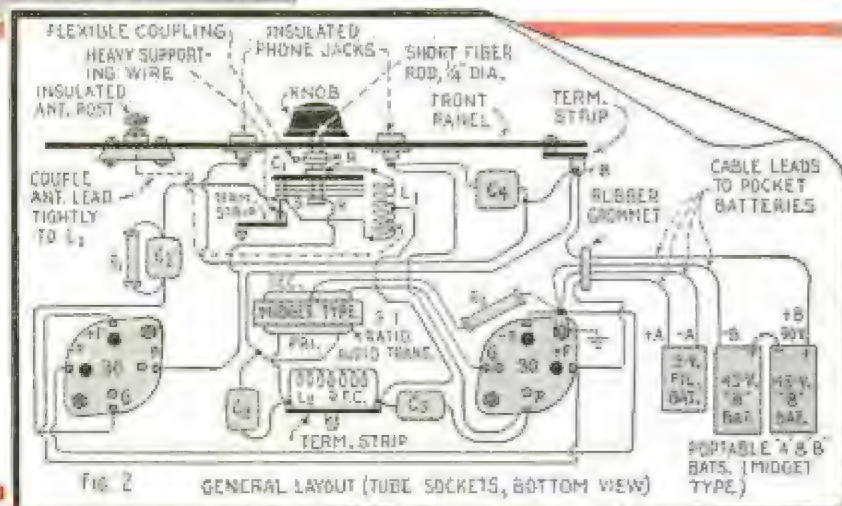
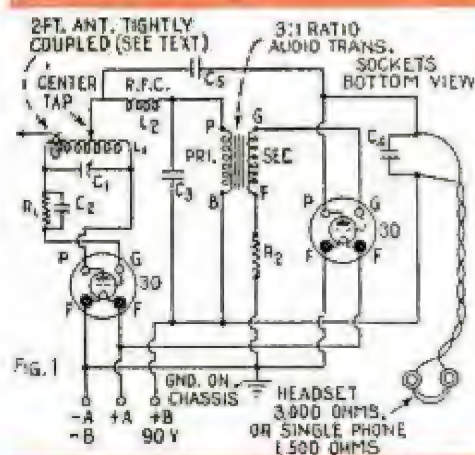
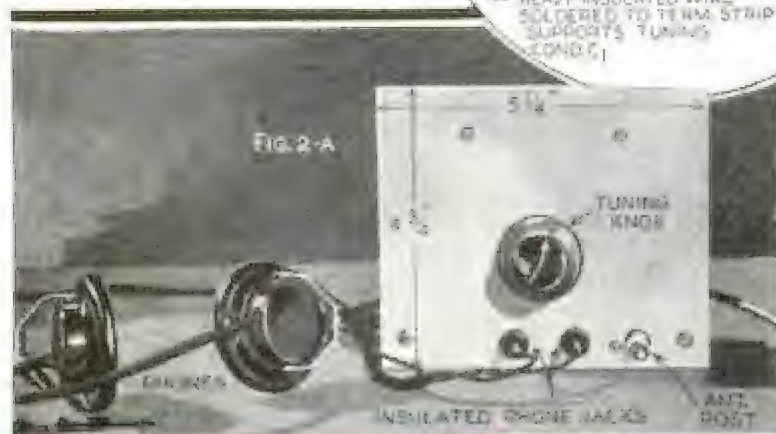
TAKE this tiny 5-meter receiver with you when you go for a ride around town and listen in on the numerous amateurs now operating phones in the 56-megacycle band.

Although the distance covered by low-lying stations is practically limited to visual range, there are some instances where 5-meter signals have covered greater distances under unusual conditions.

This compact receiver is operated with midget "A" and "B" batteries that are easily portable, and the set can be housed in a wood or cardboard box that will fit into your pocket.

A list of the materials used in the original model can be obtained from Popular Mechanics radio department upon request, without charge. Figs. 1 and 2 show the schematic and simplified wiring diagrams; construction details are clearly illustrated in Figs. 2-A and 2-B.

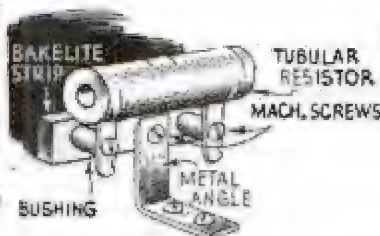
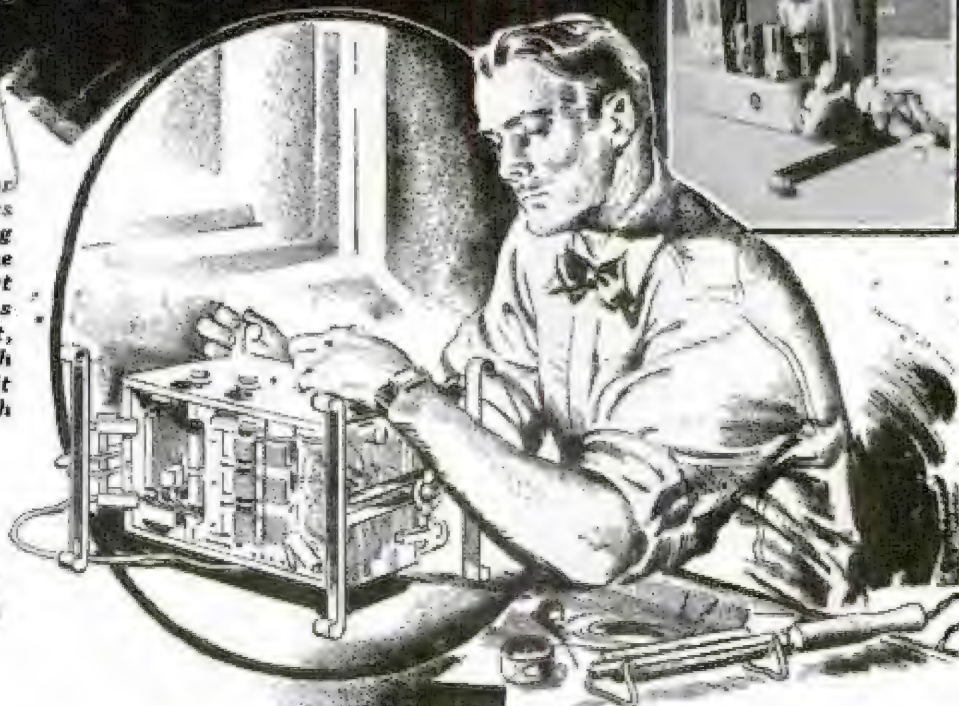
Coil L_1 consists of eight turns of No. 16 bare copper wire self-supported on the stator of variable condenser C_1 . The coil is $\frac{1}{2}$ in. in diameter, the turns being spaced the diameter of the wire. L_2 consists of forty turns of No. 26 d.c.c. wire close wound on a $\frac{1}{4}$ -in. form. No. 16 insulated hook-up wire was used for the antenna.



Practical RADIO SUGGESTIONS

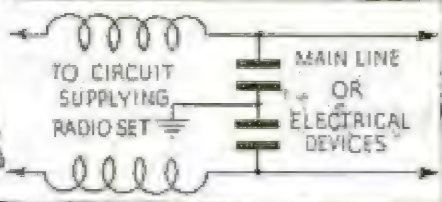
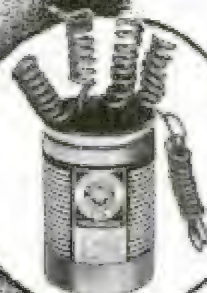
F 3580

Right, radio chassis racks for workbench aid experimenters and service men in checking receivers. Doing away with the usual blocks used to support the set in various positions while working on the circuit, these racks are clamped to each end of the chassis and permit the receiver to clear the bench on all sides



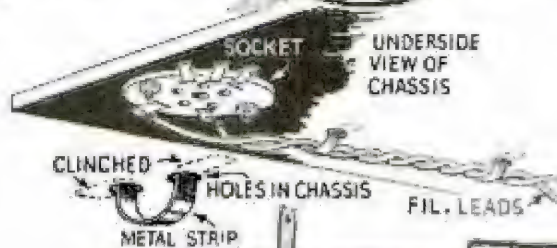
Above, rigid mounting for tubular resistor made with angle bracket and strip of scrap Bakelite. This mounting keeps resistor away from the metal chassis and permits air circulation to dissipate heat. Right, main line noise filter blocks line noise before it reaches the house wiring system. It may be connected between the main line fuse plugs and the individual circuit fuse plugs, or, it can be coupled into the line near interfering motors, refrigerators or oil-burner ignition systems

Inset, photo above shows adjustable rack clamp fastened to one side of metal chassis

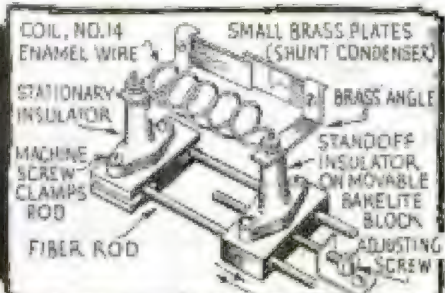
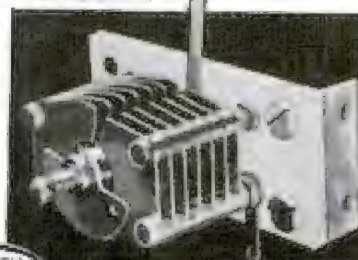
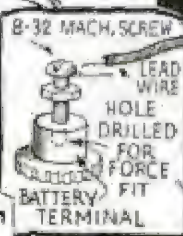


F 3613

Below, emergency connection to storage battery made with machine screw and large hex nut. This provides a good electrical connection for battery-operated receivers when battery-terminal clips are not available



Left, simple method for supporting twisted filament leads or other long conductors under receiver bases. Several of these tin clips applied in this manner will hold the wiring firmly in place



F 3612

Above, low-loss midget condenser designed with two stators, for use in ultrahigh-frequency sets. Right, homemade tuning unit for ultrashort-wave receiver, assembled with two porcelain standoff insulators and scrap parts. Capacity and inductance may be varied simultaneously by adjusting the long screw which moves one of the standoff insulators

Continental Carbon, Inc.

National Company, Inc.

D.C. to A.C. Battery Converter



Small unit operates your 110-volt home set in car

No elaborate installation is necessary to use this midget 6-volt d.c. to 110-volt a.c. converter in any location. Connected across a 6-volt storage battery, it will operate a small a.c. home receiver in your car or boat. Designed for continuous service, the output is 40 watts.

Crystal Controlled from Panel

Amateurs operating crystal-controlled transmitters in the crowded short-wave bands are now provided with a simple



NEXT MONTH—How to Build a Hurricane Emergency Receiver. No power pack, vibrator unit, dynamotor or B-batteries are necessary to operate this 2-tube receiver designed for use during floods, hurricanes or similar emergencies; works on 6-volt storage battery or dry cells. Also, **A Good Cabinet-Type Crystal Set.**

means for quickly shifting their crystal frequency a few kilocycles to avoid interference from other stations. This adjustable-gap crystal holder is provided with a flexible shaft drive and dial plate for panel mounting. A mere twist of the control knob will vary the crystal frequency up to 6 kilocycles in the 80-meter band. When operating on harmonics the frequency spread is proportionately greater; for example, 24 kilocycles in the 20-meter band. A locking device is provided for fixed-frequency operation. Special A-cut crystals are used with this holder.

Radio Desk Set Is Compact

Why clutter up your desk with numerous gadgets when you can have them all in one modern unit only 15 in. long? This individual radio desk set consists of a clock, self-closing inkwell and a 3-tube



receiver that keeps you informed of the news, market reports and other daily programs of interest. The molded cases are available in four colors and are provided with an illuminating unit complete with a 30-watt bulb. A model with temperature and humidity indicator, instead of the pen set, can be obtained if preferred.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are available without charge on receipt of postage.

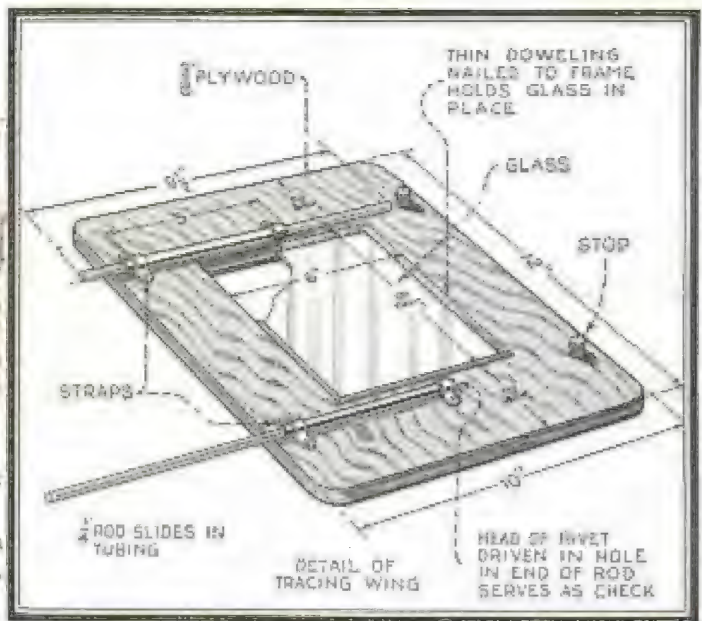


Complete DRAWING KIT

FITTED to the original clamps of a typewriter case, this drawing board provides ample working space for sketching right on the job. Its compactness and portability make it convenient to use in motorcar, railway coach or plane. Spring clips, screwed to plywood base, hold pencils, triangles and other drawing instruments which are conveniently reached by raising the hinged top. Wings, providing extra board area and a tracing glass, may be attached or detached quickly by means of telescoping rod-and-tube supports.

The dimensions given will be found suitable for building the board to fit carrying cases of the larger size portable typewriters, which leaves extra space over drawing board for storing paper, books, and other drawing material that is usually carried to the job. Straps, bent from thin sheet metal, are used to fasten tube sections of the wing supports in place. Tubing of inside diameter slightly greater than outside diameter of rod, making a loose telescopic fit,





will serve the purpose. It is only a matter of slightly offsetting tubes on the wings with those on main board to provide sufficient tension for keeping the rods from sliding out of the main tubes. Stops keep the rods from sliding completely out of wing tubes in one direction, while heads of rivets, driven in holes drilled in ends of rods, serve as stops in the other direction. A piece of frosted glass, under which a light bulb may be placed for tracing photos and drawings, is fastened in left wing by strips of thin doweling or small quarter-round nailed into frame on both

sides of glass. Rubber vacuum cups, screwed on the bottom of the base, serve as feet, raising the base to proper height for fitting over clamps and protecting table tops when board is used out of the case. Carefully filing all rough edges off rods, tubes, straps and spring-steel clips will prevent injury to hands and drawing instruments. When finished, the board should be sanded smooth with succeeding finer grades of paper and then waxed in the natural color of the wood. Chrome or brass-plating the metal parts will enhance the appearance of the job.

Simple Tool for Molding Filler Between Wallboard Joints



With this tool, it's easy to press filler firmly into joints between wallboard panels

As it is necessary to apply filler to joints between panels of wallboard in two coats if a neat job is to be done, this simple tool will be found ideal for pressing the first, or rough, coat in place. The tool is nothing more than a short length of tongue-and-groove stock. You'll find that the tongue on a piece of $\frac{7}{8}$ -in. stock of this type is just the right size to fit snugly into the wallboard joint.

Sawdust Sweeping Compound

Utilizing the accumulation of sawdust in your home workshop, the following mixture makes a good sweeping compound for the floor. Melt paraffin wax, 2 oz., in paraffin oil, 2 qts., over a water bath. Then add coarse salt, 6 oz., fine, white sand, 5 lbs., sawdust, 10 lbs., and oil of eucalyptus, 1 oz.

Monograms Neatly Stenciled on Glassware



You'll be surprised how neatly and easily you can etch monograms, designs and floral decorations on glassware, mirrors, etc., with a wax-paper stencil and a simple etching paste. First cut the stencil and then prepare the paste by mixing just enough water with a quantity of ammonium bifluoride crystals to dissolve them, after which add half this quantity of glycerin and thicken the mixture to a thin paste with calcium sulphate. You will have no trouble making the stencil adhere to the glass if the latter is heated with hot water to soften the wax surface of the paper. The paste is applied with a piece of wood, the end of which has been softened by hammering. A piece of felt mounted on a block with a strip of linen makes a good stamp pad into which the paste can be worked. Ammonium bifluoride may cause serious burns if it touches the skin, and it can be carried only in a wax-lined container.

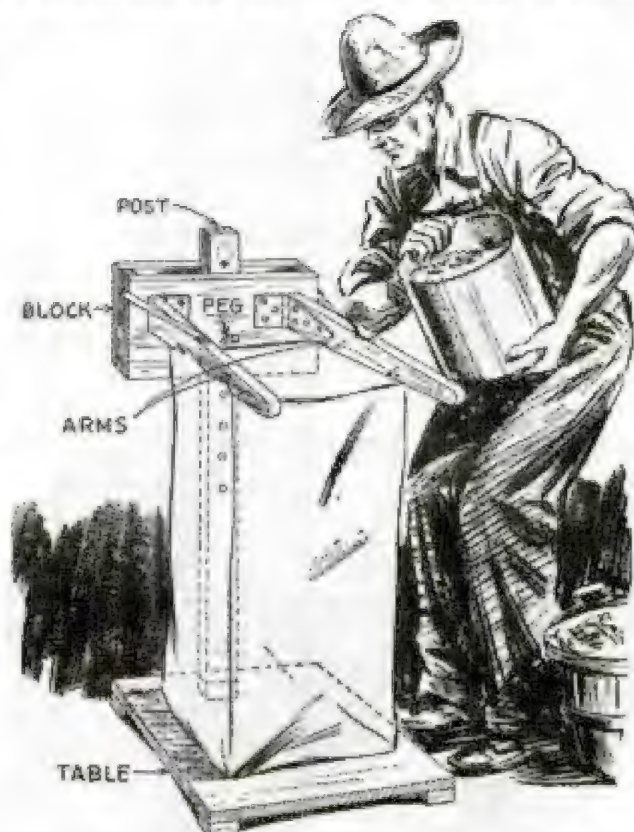
This Adjustable Holder Keeps Mouth of Sack or Bag Taut

For keeping bags and sacks open while filling them, it's hard to beat this simple holder. Adjustable in height, it has two hinged, hardwood arms which carry sharp-pointed nails bent upward to engage the mouth of a sack. Strong rubber bands attached to the arms and to the post pull the arms outward to keep the sack mouth taut. The table or base, post and arm-carrying block are made of any stock available. A peg inserted through a hole in the block and post takes care of the height adjustment.

—H. Aprahamian, Dunnville, Ont., Can.

Gas "Bailed" from Wells

Carbonic-acid gas which forms in the lower parts of wells can be removed by an opened umbrella let down and rapidly hauled up a number of times in succession. The gas being heavier than air, is simply dipped up by the inverted umbrella and brought to the surface much the same as water is lifted in a bucket.



Filling sacks single-handed is easy when this holder is used

Pressure of Bit Brace on Chest Eased by Rubber Pad

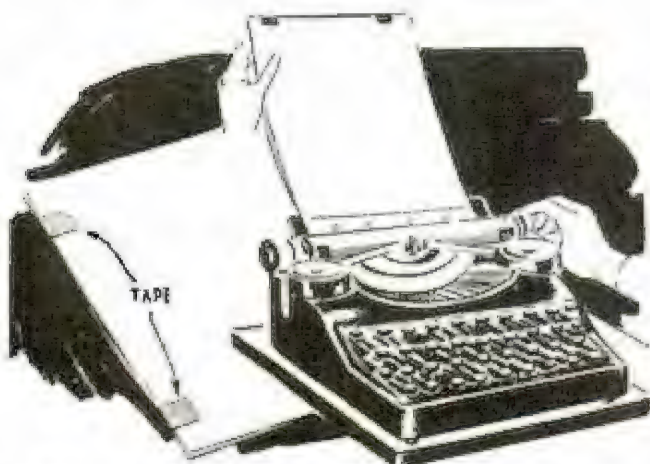


You can use a brace and bit for hours without bruising your chest if this pad is provided

One workman who had to use a brace and bit considerably put a sponge-rubber pad in a pocket sewed to the bib of his overalls to cushion the end of the brace where it pressed against his chest. The pad fit loosely in the pocket, and was quickly removed and stored in his tool chest when not in use.

Cutting Stencil in Typewriter Without Wrinkling

When a mimeograph stencil is being cut on a typewriter, and it tends to crease while repeatedly turning the platen, try fastening the lower edges of the stencil and backing sheet together with a couple strips of gummed paper. This will hold



Mimeograph stencil taped together at bottom to prevent wrinkling in the typewriter

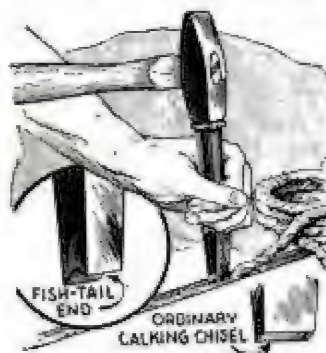
the wax sheet smoothly throughout the typing, and a sharp knife may be inserted between the strips to cut them, when finished.—G. E. Hendrickson, Argyle, Wis.

Leaky Air Valve on Radiator Kept from Marring Wall

If one of the air valves on your steam radiator begins to leak and spatters water over the wall, cut an opening in a fair-sized hollow rubber ball and slip it over the valve. This will catch the water that leaks out and will protect the walls and floor until a new valve can be installed.—Opie Read, Jr., Chicago.



Calking Tool with Fish-Tail End



When calking cracks with oakum and similar materials, file the end of the tool to an inverted V-shape or fish tail and you will find that a better job can be done than when the tool is used with a square end. Filed to such a shape, the tool tends to force the calking material tightly in the crack.

Preventing Loss of Small Drills

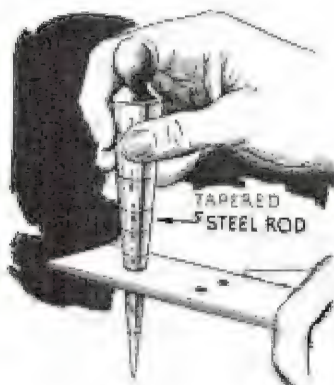
To avoid loss of small drills from an open tool box, one carpenter screwed a discarded spectacle case to the inside surface of the box to hold them as shown. To permit



ready removal of very small drills, the recess provided under the front edge of the case was filled with wood so that the drills could not work under the overhanging edge where they would be hard to get out.

Calibrated Punch Measures Holes

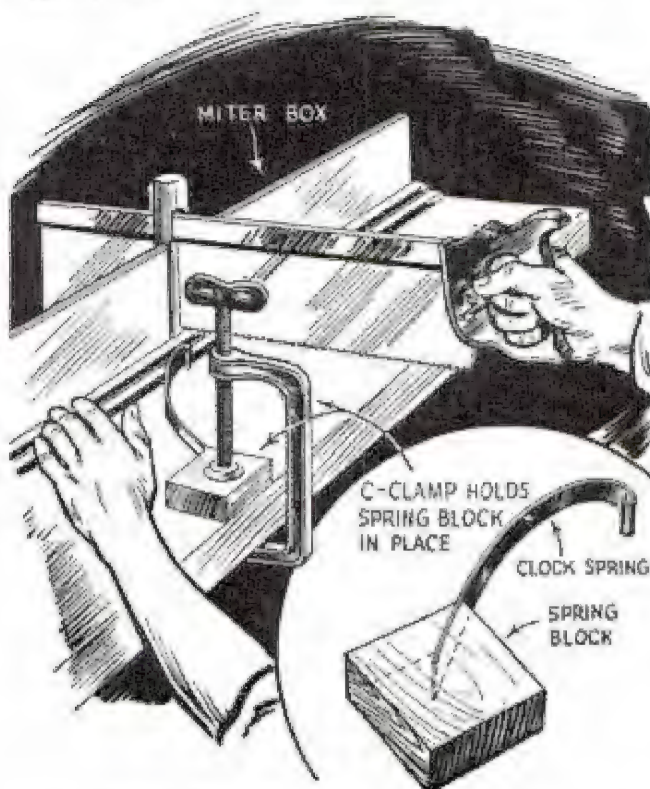
Turned from a short piece of steel rod, this tapered punch enables you to determine quickly the diameter of a hole. To



calibrate the punch, it is inserted into holes of various known diameters, and lines are scribed around it at the top of each hole, after which the diameter is stamped in the metal at each of the lines.

Miter Box Has Spring Clamp for Holding Small Molding

When cutting strips of small molding in a miter box, try using this simple spring to keep the work from moving under pressure of the saw. Just insert a length of clock spring into a hardwood block, slotted as shown. In use the block is attached to the miter box with a C-clamp so that the end of the spring bears against the side of the box. The work is then inserted with the end of the spring resting against it.



Small work is handled easily in a miter box without "jumping" when this spring is used

Wheel Chair Has Mudguards to Protect Patient's Sleeves

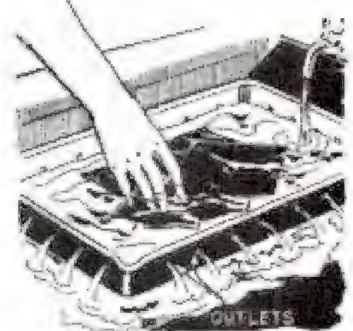


By using these guards, a patient in a wheel chair can operate it without soiling his sleeves

To avoid soiling his sleeves on the tires of his wheel chair when traveling on wet sidewalks, one patient had sheet-metal mudguards put on the underside of the chair arms as shown. The edges are turned down at right angles and are attached to the arms with wood blocks and screws. The guards are not wide enough to interfere with the hands when moving the chair.

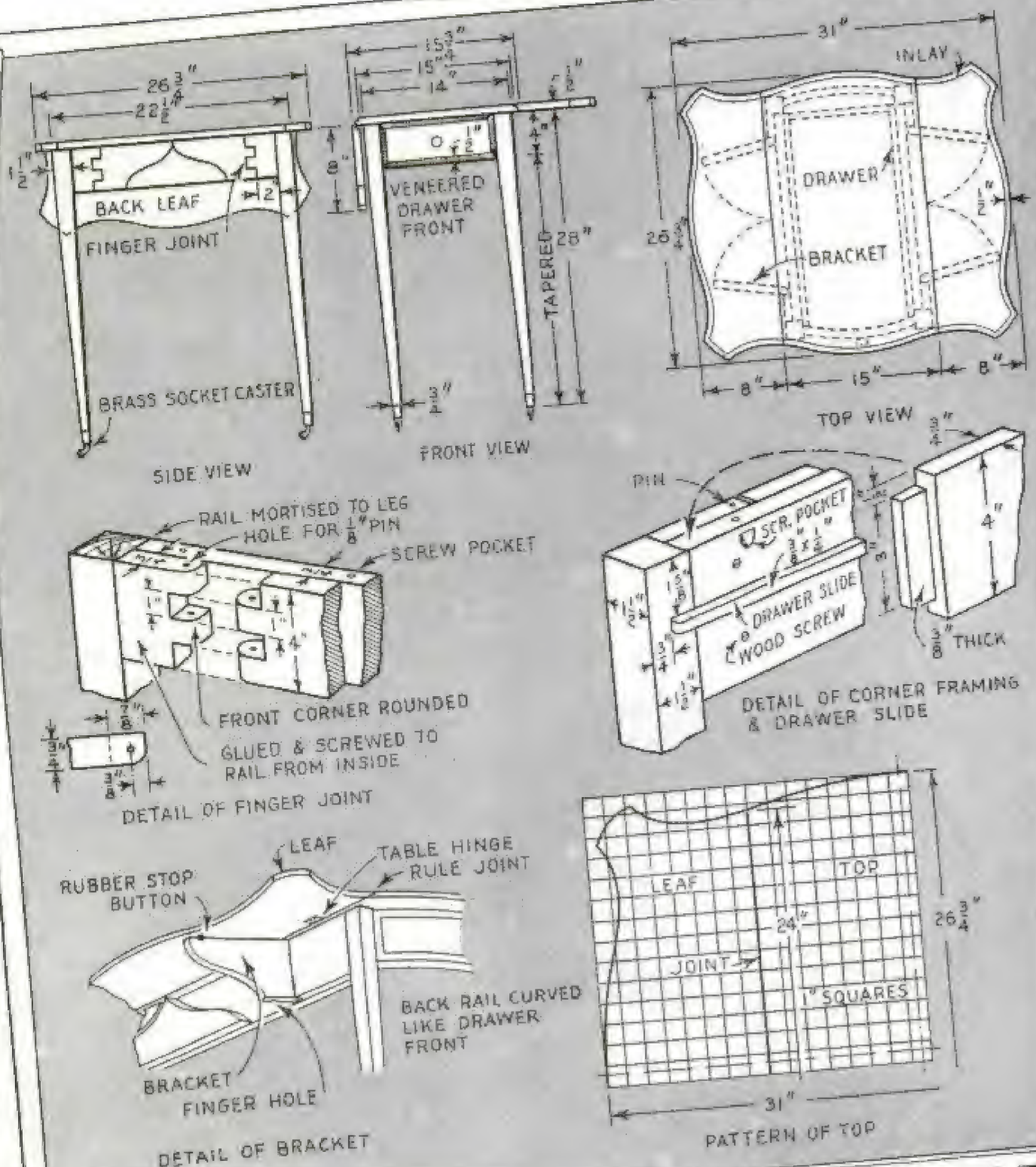
Drain Holes in Washing Tray Keep Prints in Place

By merely drilling a number of small holes about $\frac{1}{2}$ in. below the rim of my photo-washing tray so that the water will drain off before it reaches the top of the pan, I overcame the tendency of the prints to be washed over the edge of the pan. This arrangement permits the prints to be washed in a short time as a stronger stream of water can be used.



—Wayne C. Leckey, Aurora, Ill.

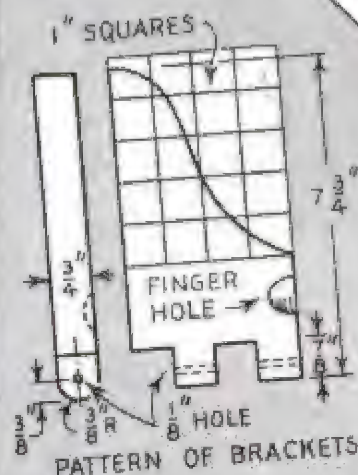
PEMBROKE TABLE



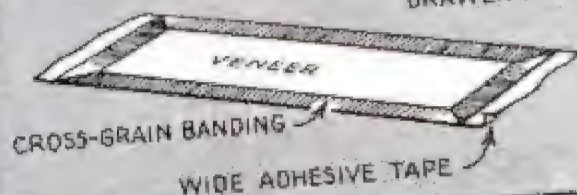
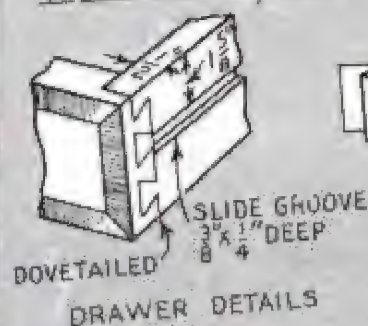
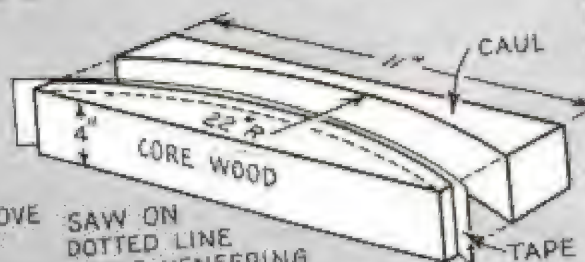
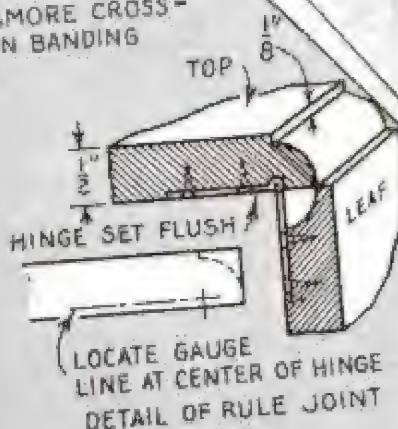
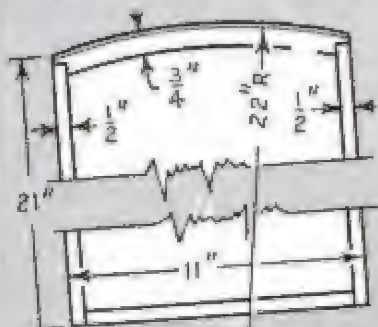
Designed by a cabinetmaker whose name has become a household word, the Pembroke table is still a favorite of modern interior decorators. By following these plans you can build an authentic copy of the original

**POPULAR
MECHANICS
MAGAZINE**

by Hepplewhite



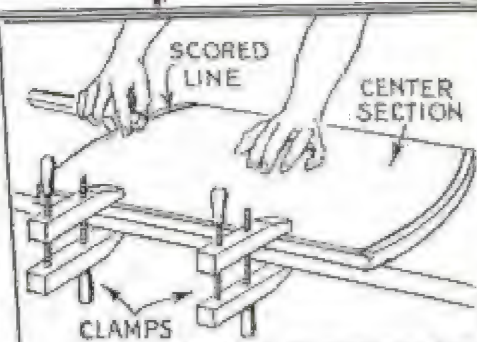
MAHOGANY WITH
CURLY MAPLE OR
SYCAMORE CROSS-
GRAIN BANDING



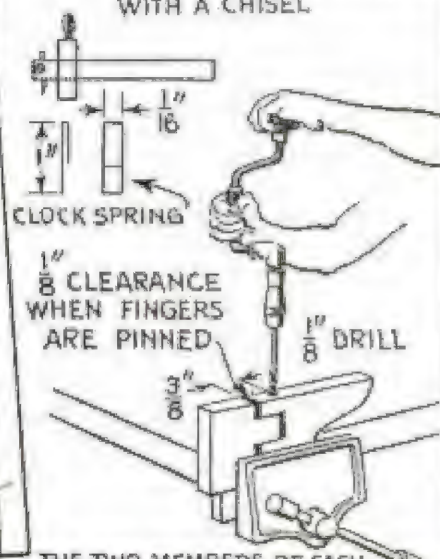
SAW ON
DOTTED LINE
AFTER VENEERING

SET-UP FOR VENEERING
DRAWER FRONT & BACK RAIL

NOTE - VENEER AND
BANDING ARE ASSEMBLED
ON TAPE FACE DOWN
BEFORE VENEERING



THE EDGE IS SCORED FOR
BANDING WITH A STEEL
CUTTER-THEN FINISHED
WITH A CHISEL



THE TWO MEMBERS OF EACH
BRACKET SHOULD BE DRILLED TOGETHER

SHEET NO. 1
POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUEPRINT No. SN 956

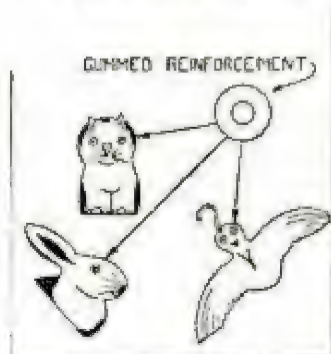
Old Flooring Removed Quickly with This Wrecking Bar



This simple tool solves the problem of removing old flooring for the inexperienced workman

By bending a piece of $\frac{1}{2}$ by 2-in. flat steel to a U-shape and welding it to a length of $\frac{3}{4}$ -in. iron rod, you have a dandy tool for removing old flooring. In use, the bar is slipped over a floor board near a joist and the handle is pulled toward the workman. This pries the board away from the joist and, at the same time, tends to pull the tongue from the groove of the adjoining board without splitting it off.—C. H. Wilson, San Antonio, Tex.

Eyes for Animal-Cutout Toys



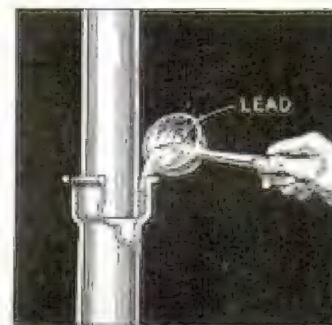
When adding the features to animal cutouts a clever method of representing the eyes can be had by utilizing gummed notebook reinforcements. These little circular pieces of cloth

or paper provide a neat appearance on a dark background as the center of the re-

inforcement simulates the pupil of the eye. Where a number of figures are being finished this method speeds up the work and assures uniform results.

Damp Oakum Soaked in Oil Before Leading Pipe Joints

If there is no dry oakum at hand when leading pipe joints, and you have to use some that is damp, pour a small quantity of oil over it after it has been tamped in place. The oil will help prevent the formation of steam when the hot lead touches the damp oakum, thus preventing the molten lead from being thrown on the worker by hot vapors suddenly building up a pressure under it.

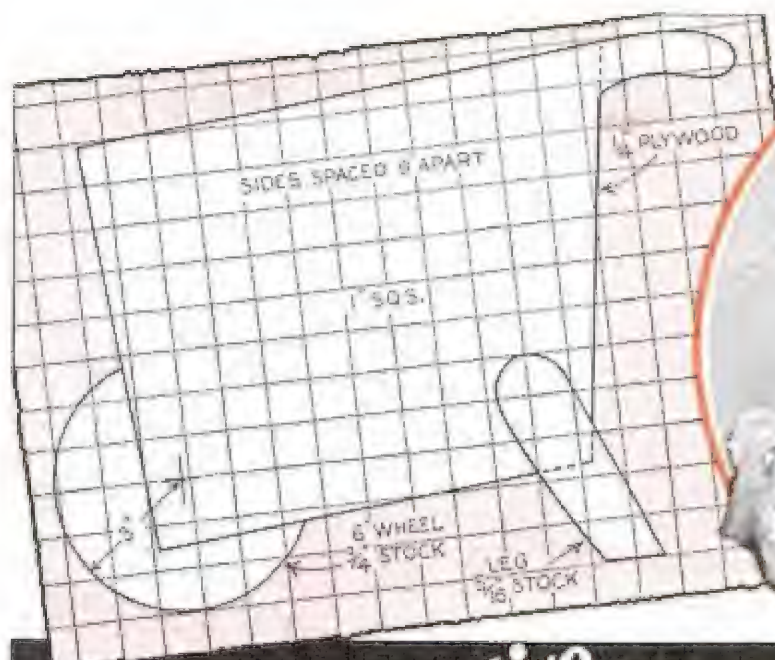


Safety Beacons for Ice Skaters

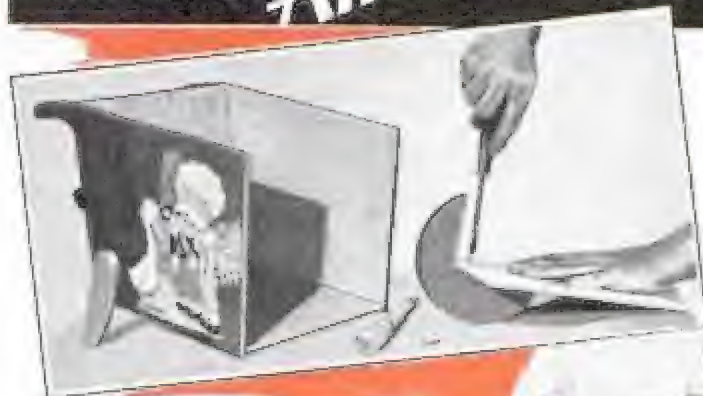
To avoid accidents while skating at night on a lake or pond where ice is being harvested, or where there are open spaces of water, a number of these flares will mark off the danger zones. They are simply auto-cushion springs holding cotton waste which is saturated with used crankcase oil and ignited.



When saturated with used auto crankcase oil, these flares will burn for a long time

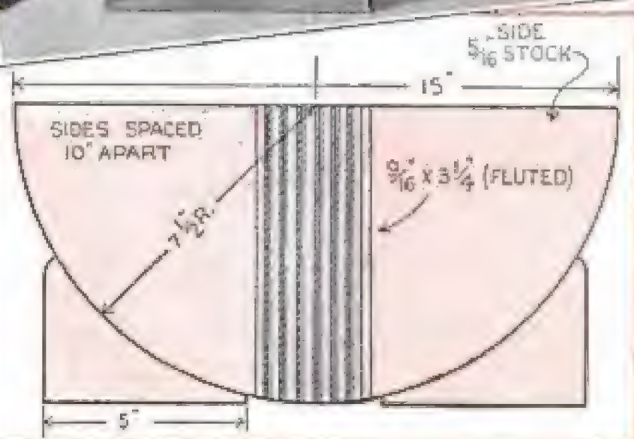
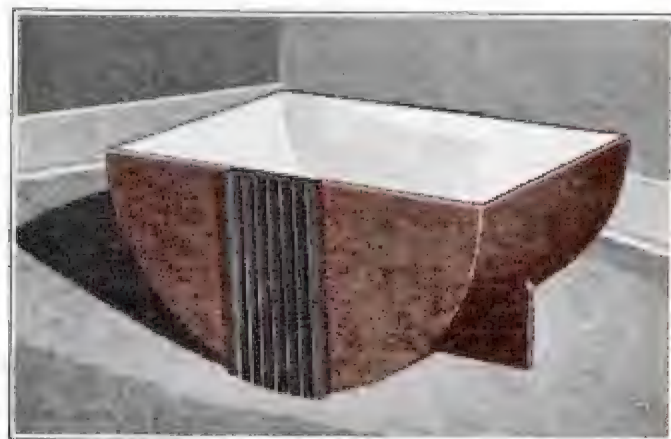


TWO ATTRACTIVE WASTE BASKETS

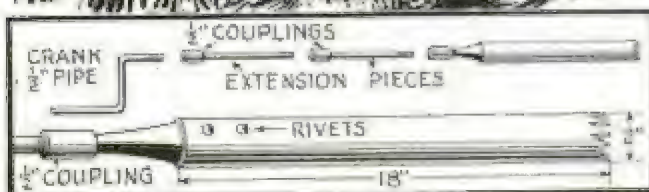


A "wheelbarrow" basket makes an ideal unit for a child's room, but it is not out of place if used elsewhere. Stock is $\frac{1}{4}$ -in. plywood, all joints being butted and nailed. The "wheel" is cut from $\frac{3}{4}$ -in. stock and is screwed to the front of the basket. Legs are sawed from $5/16$ -in. stock and are nailed in place in the position shown. The width of the basket should be about 9 in. for pleasing proportions. Pictures can be cut from a magazine or a discarded ten-cent picture book, and pasted to the sides

The basket shown below is a dandy companion piece for a modern desk. Construction starts with the two sides, which are sawed to shape and then rabbeted on the shaper or circular saw to take the bottom. The latter is either composition board or heavy cardboard and is nailed to the sides. If composition board is used, it can be bent to shape around a hot furnace pipe. A center ornament for each side is made from hardwood, and fluted on the shaper or drill press. The ornaments are finished natural, the rest in color



Simple Boring Tool to Lay Pipe under Sidewalks



This tool will bore a hole quickly under a sidewalk for laying pipe or conduit

Having a job of laying electrical conduit under some sidewalks and driveways, I made this boring tool to get under the walks without breaking up the concrete. The tool is nothing more than an 18-in. length of 2-in. pipe having teeth sawed on one end and a yoke riveted to the other end. The yoke is threaded to take a $\frac{1}{2}$ -in. coupling so that a handle and extension pieces can be added as needed. The teeth are shaped so that they tend to cut into the ground when the tool is rotated toward its user's right.

—L. S. Landmichl, Riverton, Wyo.

Bench Hardy for the Home Shop



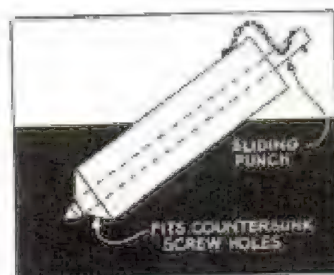
Projecting through your workbench top at one corner, a large cold chisel provides a serviceable hardy that can be slipped in place quickly when it is necessary to cut light material such as small metal rods and sheet stock. The lower end of

the chisel rests on an angle-iron bracket screwed to the bench leg. When not in use, the chisel is removed and kept in a bench drawer or cabinet.

Self-Centering Marking Punch Locates Screw Holes

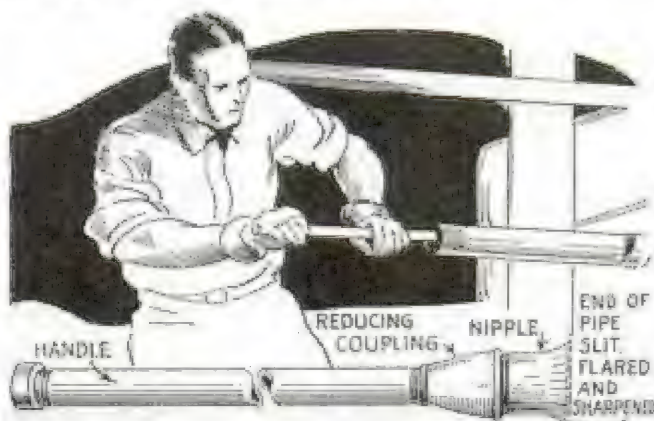
Made from a piece of brass or soft steel, this marking punch assures accuracy in locating screw holes for hinges and other hardware which is mounted on wood. The tool is drilled lengthwise through the center to take a pointed steel punch, and the end is beveled at a 60° angle to fit in the countersunk holes of the hardware.

—E. T. Gunderson, Jr., Humboldt, Ia.



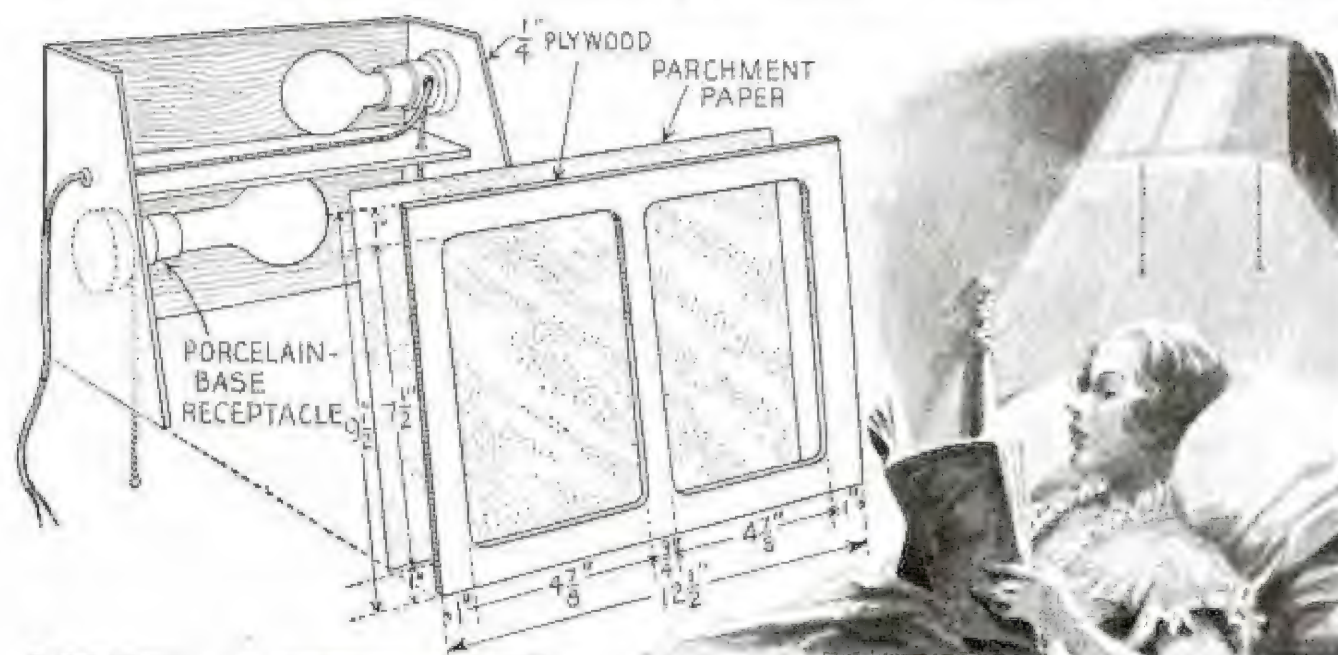
Flue Cleaner Made from Pipe and Fittings

Two pieces of pipe and a reducing coupling can be converted into an efficient cleaner for boiler flues and rusted water pipes. Get a coupling and a nipple that will slip inside the flue easily. Assemble them, and then, with a hack saw, cut slots in the end of the nipple 2 in. deep and $\frac{3}{4}$ in. apart. Bend the resulting segments outward slightly at the end and sharpen them on a grinder, to make the cutting end of your cleaner. Now screw a length of pipe into the other end of the coupling for a handle. This cleaner has been found more efficient and longer-lasting than many brushes used for this work.

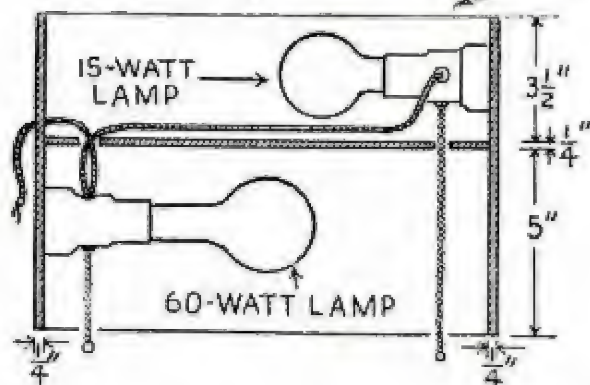


This flue cleaner "shaves" rust and corrosion from the pipes instead of scraping

Bed Lamp Gives Direct and Indirect Light



If you like to read in bed here's just what you want. It differs from most bed lamps in that there are two lights, one above the other, thus serving the two-fold purpose of giving a soft, indirect light in the room or a direct light for reading. The whole thing is made of 1/4-in. plywood, the outside finished as you choose, the interior with aluminum paint or "eggshell" enamel. The partition between the lights is faced on both sides with asbestos paper. Porcelain pull-chain sockets are wired as indicated at the left. The front section of the shade is cut out to form a grill and a piece of colored parchment paper is placed under it when assembling

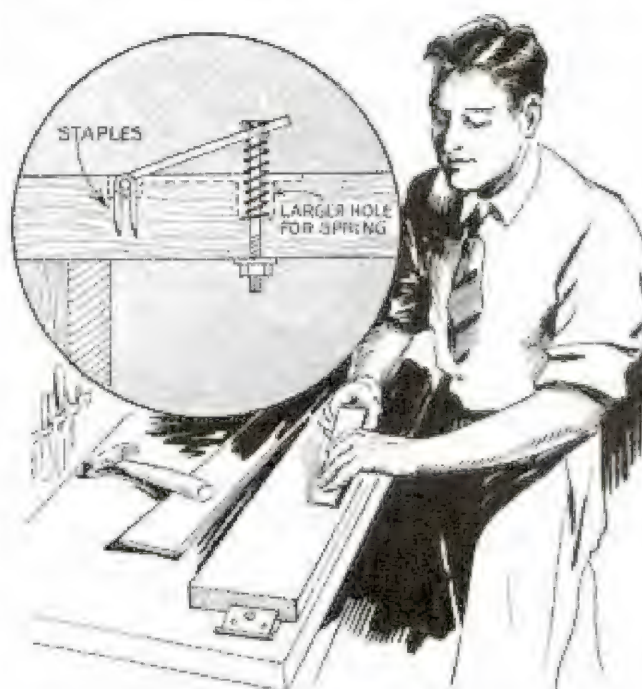


Pivoted Bench Stop Made from Butt Hinge Is Adjustable

Made by recessing half of a door butt hinge in a workbench top and pivoting the hinge pin with staples, this stop is adjustable in height. Adjustment is obtained by a long stove bolt over which a coil spring is slipped between the stop and the bench top as shown in the circular detail. A large hole part way through the bench accommodates the spring when it is compressed to bring the stop flush with the bench top.

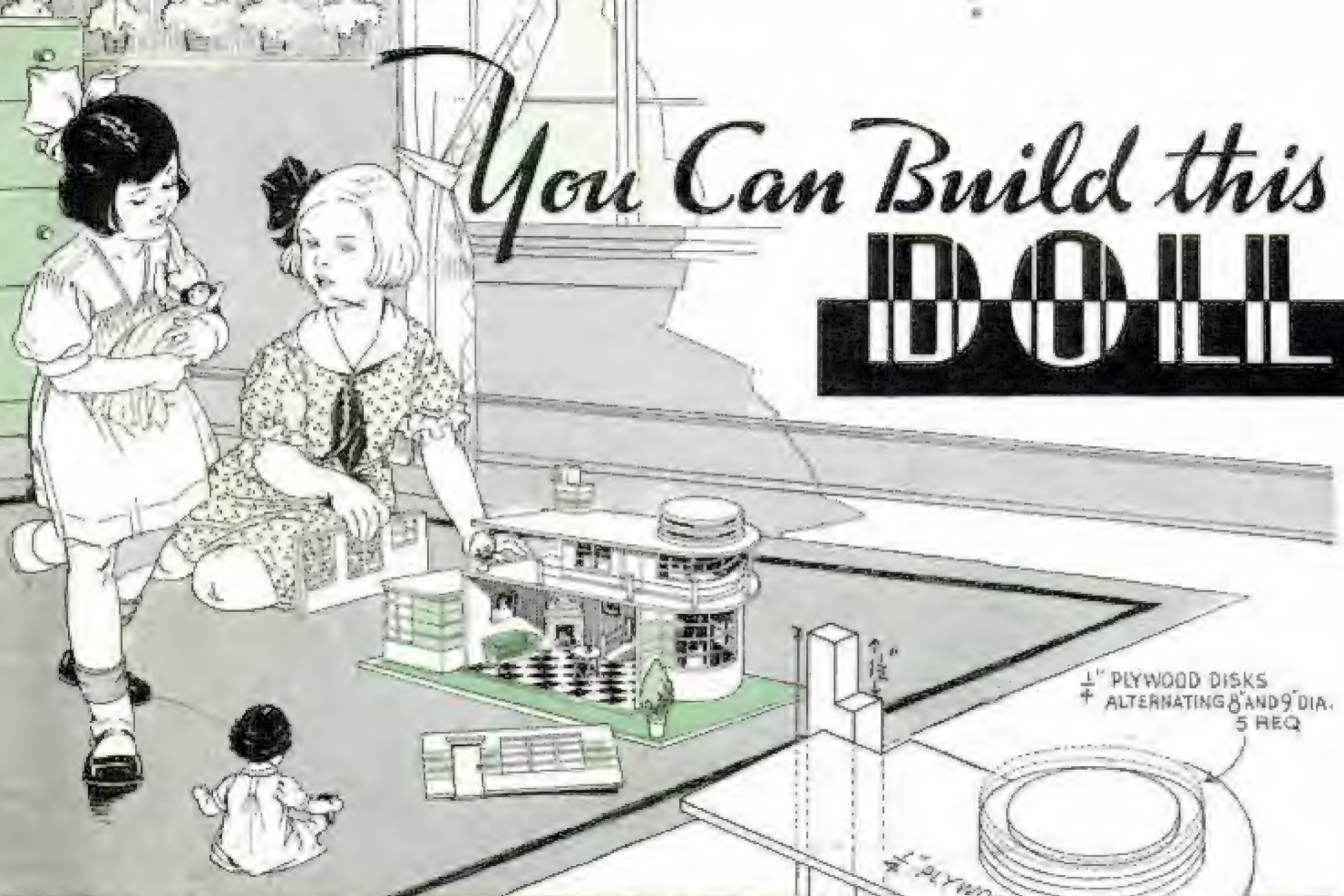
Cleaning Buckskin Shoes

Soiled shoes made with the flesh side of the leather exposed can be cleaned on a fine-wire buffing wheel. The shoe should be held lightly against the rotating wheel, taking care not to damage the leather. This should not be done excessively, of course, as the cleaning is accomplished by the rotating wheel removing the soiled leather fibers and raising new ones.

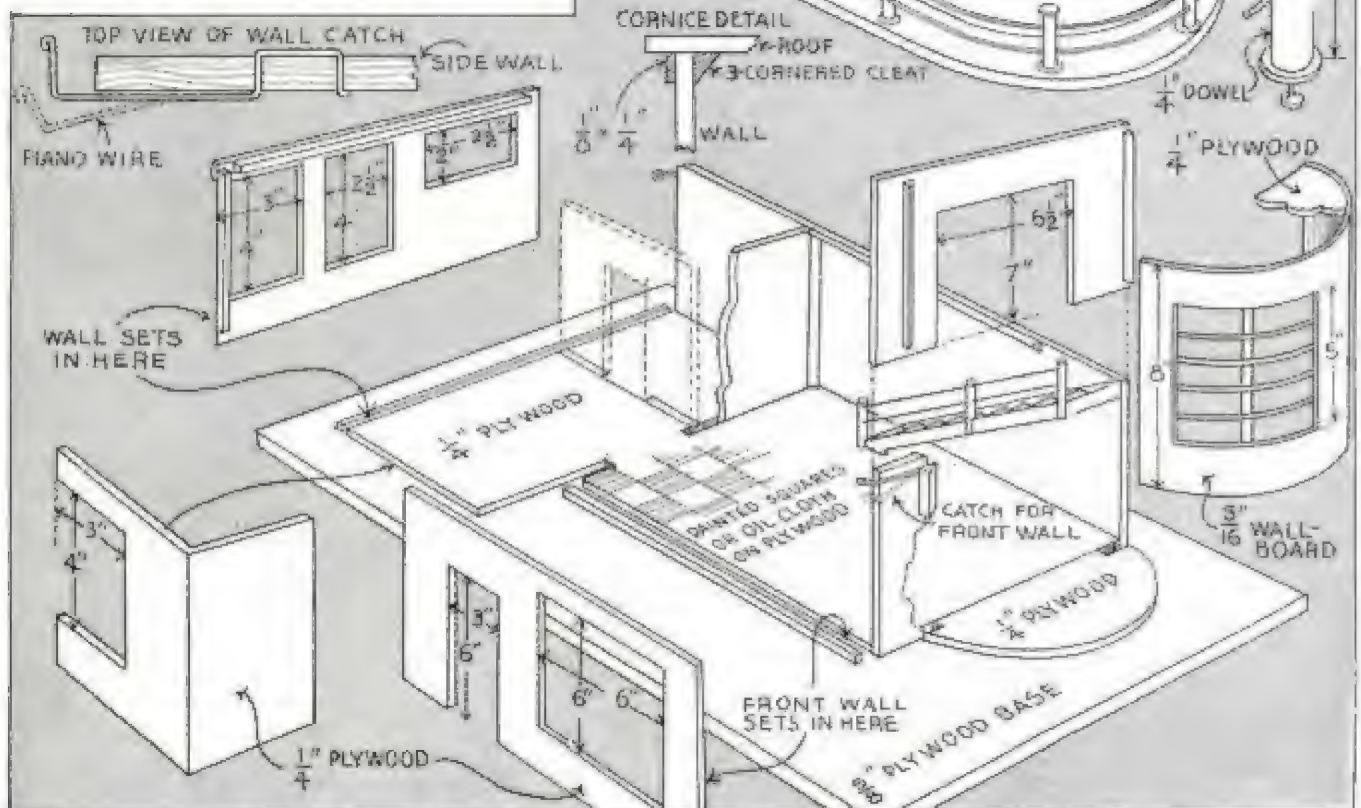


This bench stop is rapidly adjusted with a screw-driver by driving the bolt in or out of a nut on the underside of the bench

You Can Build this DOLL

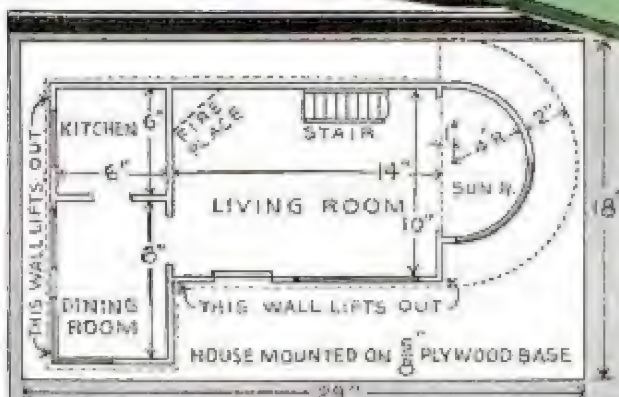


Just think of the pleasure the youngsters will get from this modern doll house! Up-to-the-minute styling makes it easy to build, for simplicity is always a feature of modern design. A jig saw comes in handy for cutting the curved parts, but for the balance you can get along nicely with hand tools and glue

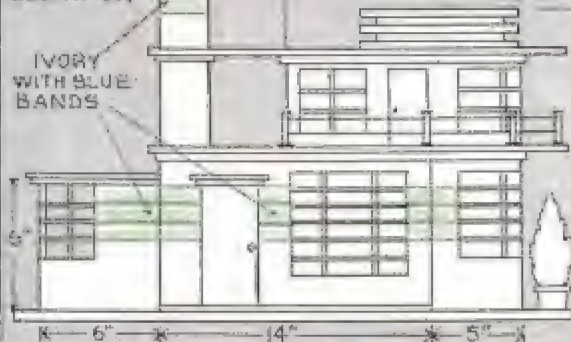


HOUSE

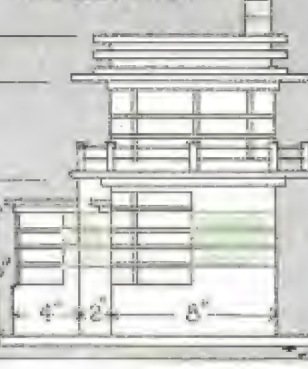
of Plywood



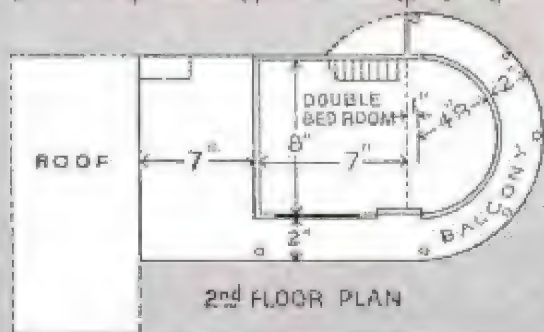
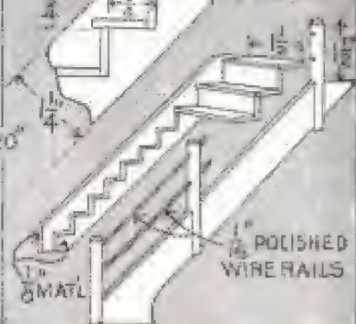
FRONT ELEVATION



SIDE ELEVATION



STAIR DETAIL



Practically the whole thing is made of plywood and wallboard. Windows are of transparent celluloid. Two walls are made so that they can be lifted out to give easy access to the interior. Plan views are given on this page and at the left a perspective shows the assembly. Only general dimensions are given, this being done so that you can make the house larger if you wish. The trickiest parts to make are the curved ends. After bending the wallboard over a form, glue the celluloid windowpanes in place with strips of cardboard on the inside as in the upper right detail

Disk Scraper Makes Quick Work of Cleaning Sidewalks



Removing ice, snow and hard mud from sidewalks is no problem when this disk scraper is used

Cleaning sidewalks, driveways and floors is simplified with this scraper, which literally "shaves" off ice, packed snow and grease, dried mud, etc. The scraper is made by pivoting a long, stiff handle to a disk from an old disk harrow.

Lugs Hold Pan Cover in Place While Draining Vegetables

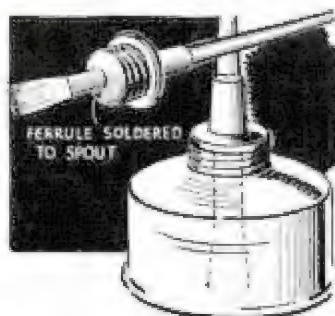


Have you ever had a pot cover slip, when draining vegetables, and let escaping vapor burn your arm? If so, you can avoid a recurrence by simply

soldering three equally spaced strips of tin to the edge of the cover so that when bent downward, they project down over the sides of the pot.

Oil Can Makes Dandy Glue Pot

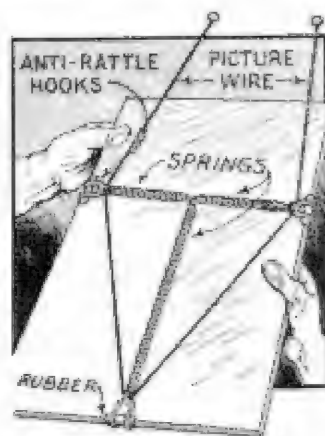
You can make a handy glue, shellac or cement container from a small oil can such as fine, high-grade oils come in. Just remove the spout and cut it off so



that the handle of an artist's cheap brush can be inserted into it. Push the brush into the spout so that the bristles just clear the bottom of the can when the spout is in place. Then solder the ferrule of the brush to the top end of the spout to make the can air-tight.

Plate-Glass Mirror Is Hung with Anti-Rattler Hooks

Faced with the problem of hanging a large plate-glass mirror, which had no



frame nor any provision for holding it, I did the job quite easily with anti-rattler assemblies often used on auto-brake rods. These were hooked over the bottom and sides of the mirror as shown, which was then hung up with

strong picture wire. Strips of rubber were folded over the edges of the mirror where the hooks of the anti-rattlers touched it to prevent chipping the glass.

—D. Harold Hammond, Richmond, Ind.

Specimens on Microscope Slides Held by Gummed Eyelets

Amateur microscopists who use low-power microscopes will find that gummed eyelet reinforcements of the type used on loose-leaf note books, are handy for mounting specimens on the glass slides. To do this, a Cellophane disk slightly smaller in diameter than the eyelet is placed over the specimen, after which the eyelet is dampened and pressed over the assembly. Such a mounting will work well on microscopes of less than 250 power.

—Paul L. Ambelang, Chicago.

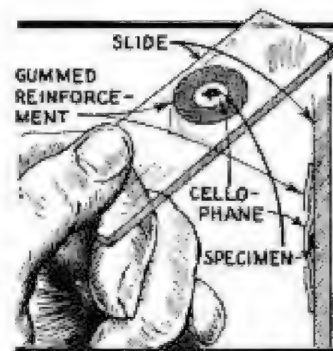
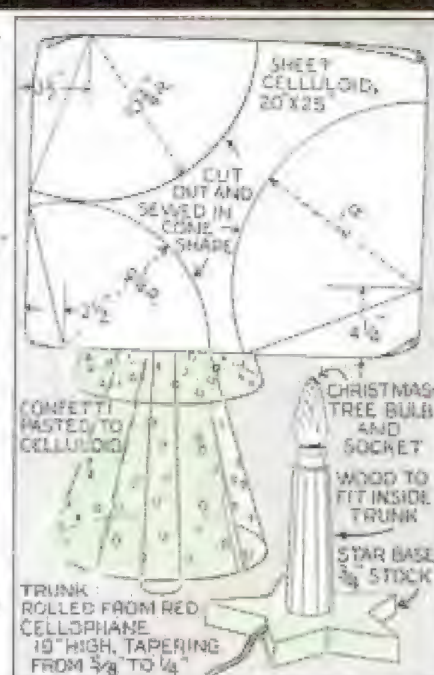
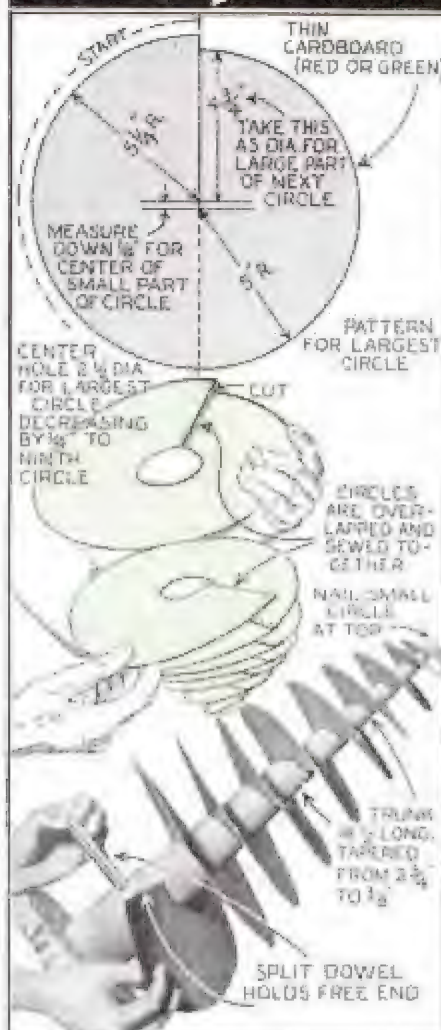




Table-Top CHRISTMAS TREES



Cut ten circles from thin cardboard according to the plan shown at the left, sew them together and pull the whole thing down over a hardwood cone, fastening the free end with a split dowel. Add a sprinkling of artificial snow, and there's your Christmas tree. The cutout tree, center, above, is always popular. Holes in the plywood facing pieces are backed with tinted Cellophane to color the light furnished by a string of lamps. The third design requires a half sheet of celloid. Three "cones" are cut from this sheet, each cone being rolled up and sewed. The conical "trunk" of the tree is red Cellophane. Cones are fastened to the trunk with pins. The base is star-shaped and supports a wood column and socket for Christmas-tree light

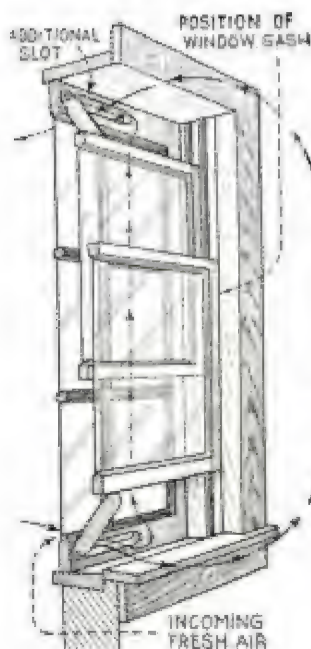
Thin Cloth Given Paper Backing to Cut True Patterns



Light, thin cloth backed with heavy paper to keep it from "creeping" in front of scissors

Unless light, thin cloth is stiffened in some way when cutting patterns from it, it is likely to "creep" ahead of the scissors, so that an irregular cut is made and the piece of goods ruined. A good way to stiffen cloth is to baste a heavy piece of paper to the underside and then cut through both the cloth and paper.

Double Vents in Storm Sash Improve Ventilation

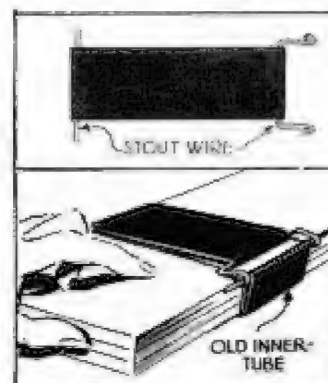


If you object to using storm sash on your bedroom windows because of inadequate ventilation during sleeping hours, air vents in the top and bottom of the sash will solve the problem. When the window sash are raised from the bottom and lowered from the top slightly as shown, fresh air enters through

the lower vent, circulates through the room and out at the top vent at a surprisingly rapid rate, completely changing the air in the room at frequent intervals. During waking hours, the window sash and vent covers are closed, giving you a tight storm protection.

Hooks for Rubber-Band Clamps

When wide rubber bands, which have been cut from old inner tubes, are used to hold bundled material, or for clamps on light work, the simple wire fastener shown will solve the problem of attaching the ends of the band.



The fastener is made of strong wire, and consists of one straight length and one length bent to a wide U-shape with hooks on the ends.

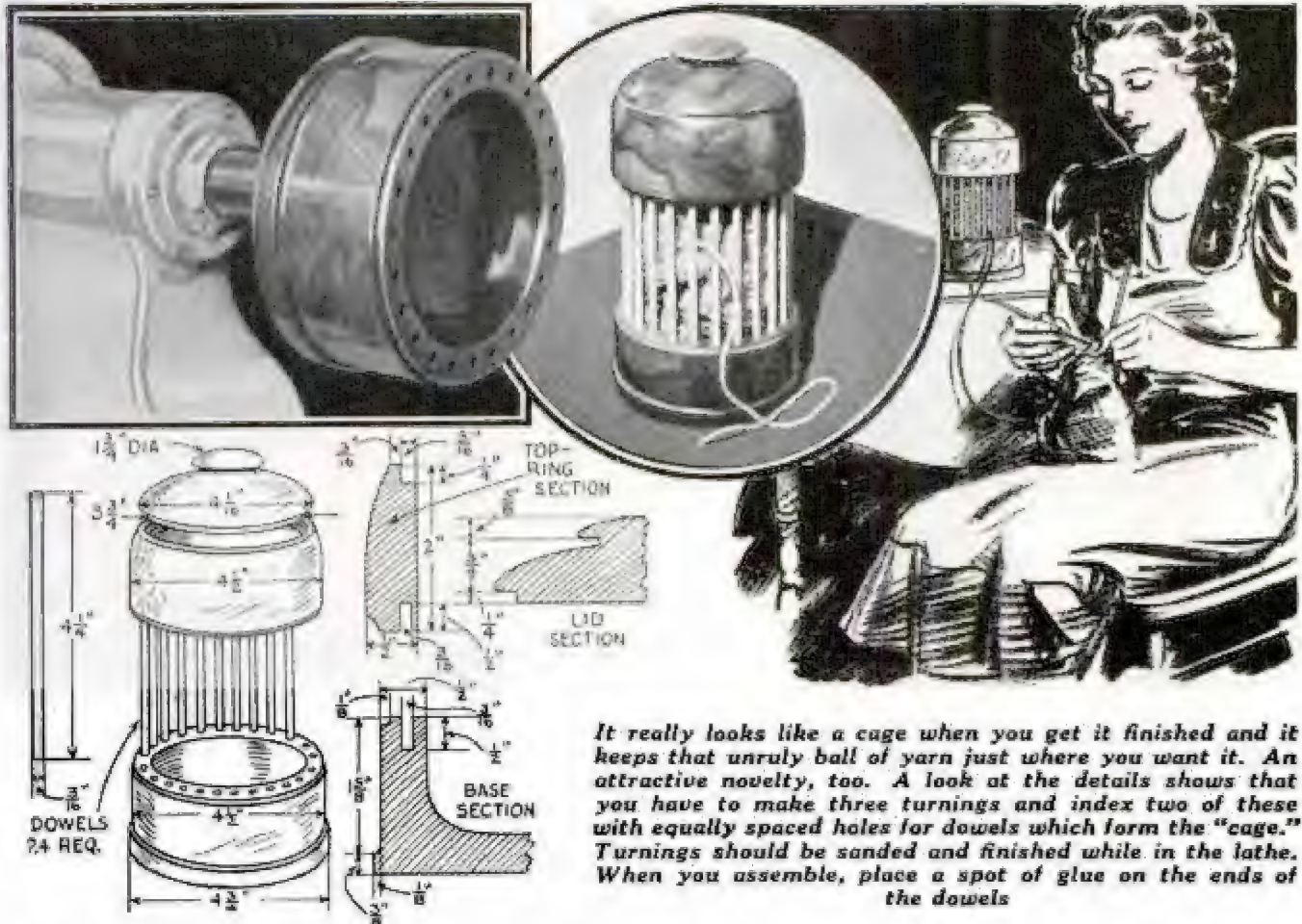
Signs Painted on Screen Wire over Backing Board

The difficulty of neatly painting signs on screen wire is easily overcome by first outlining the lettering on a board, which is then fastened against the wire with thumbtacks on the side opposite that from which the lettering is to be done. Besides serving as a guide, the board backing holds the wire smoothly.



Lettering outlined on board is easily copied on screen wire with paint

Novel "Cage" Holds Ball of Knitting Yarn



It really looks like a cage when you get it finished and it keeps that unruly ball of yarn just where you want it. An attractive novelty, too. A look at the details shows that you have to make three turnings and index two of these with equally spaced holes for dowels which form the "cage." Turnings should be sanded and finished while in the lathe. When you assemble, place a spot of glue on the ends of the dowels

Typewriter Platen Has Ruled Lines to Aid in Alining Work

Ruled in a true horizontal plane across your typewriter platen, a number of equally spaced parallel lines will aid greatly in alining work, especially cards and shipping tags, which are difficult to aline in the usual manner. To rule the lines, leave the platen in the typewriter and set it to single space. Then, get a ruling pen and regular ink of good quality, the color being yellow or red. Use any straightedge. Lay it on the platen and rule the lines. Be sure that the ink is dry before turning the platen so far that the wet lines will rub the portions of the carriage that come in contact with the platen. If a ruling pen is not at hand, a regular fountain pen will serve the purpose, being sure that all the black ink has been washed out of the rubber reservoir before filling it with the yellow ink.—Paul Erickson, Laurel, Nebr.

☐ Newly plastered walls should not be painted or papered for eight to ten weeks and, not even then if the weather is damp.



Small work is easily alined with the aid of these parallel lines

Hand Tools Built this



By
FREDRIK DEUKER
and **JOHN MODROCH**

BUILT after modern "skyscraper" design, these compact twin vanity cabinets and dresser, together with the octagonal vanity seat, full-length mirror and double bed, make up the essential furniture around which the outfitting of a distinctive modern bedroom can be planned. Due to the simple lines and adaptable proportions of these essential pieces, little difficulty will be experienced by the builder or planner when selecting whatever up-to-date fabric, wallpaper, floor covering and lamps might be desired to complete the decoration of the room.

Since the modern cabinet construction employed departs from the traditional style, joining has been simplified so that the tools found in the average home workshop will be ample for the job. In the cabinets there are no false panels or waste compartments to collect dust. Except for the divan base and drawers, $\frac{3}{4}$ -in. lumber is used throughout, with $1\frac{1}{16}$ -in. plywood for doors. Any close-grained wood, hard or soft, that will take a smooth coat of enamel, may be used with good results.



Or, if you wish, you can use walnut plywood, finishing the wood in the natural color.

Unless you use plywood throughout, gluing up stock for the sides and shelves of the two vanity cabinets and dresser is the first step. Before gluing, the pieces should be doweled or splined if full strength is desired. Dimensions for the dresser will be found in Fig. 3. First, cut the bottom and shelves to size, noting that the shelving runs the full length of the dresser. After grooving the side pieces, and rabbeting the ends to fit into the spe-

BEDROOM SUITE

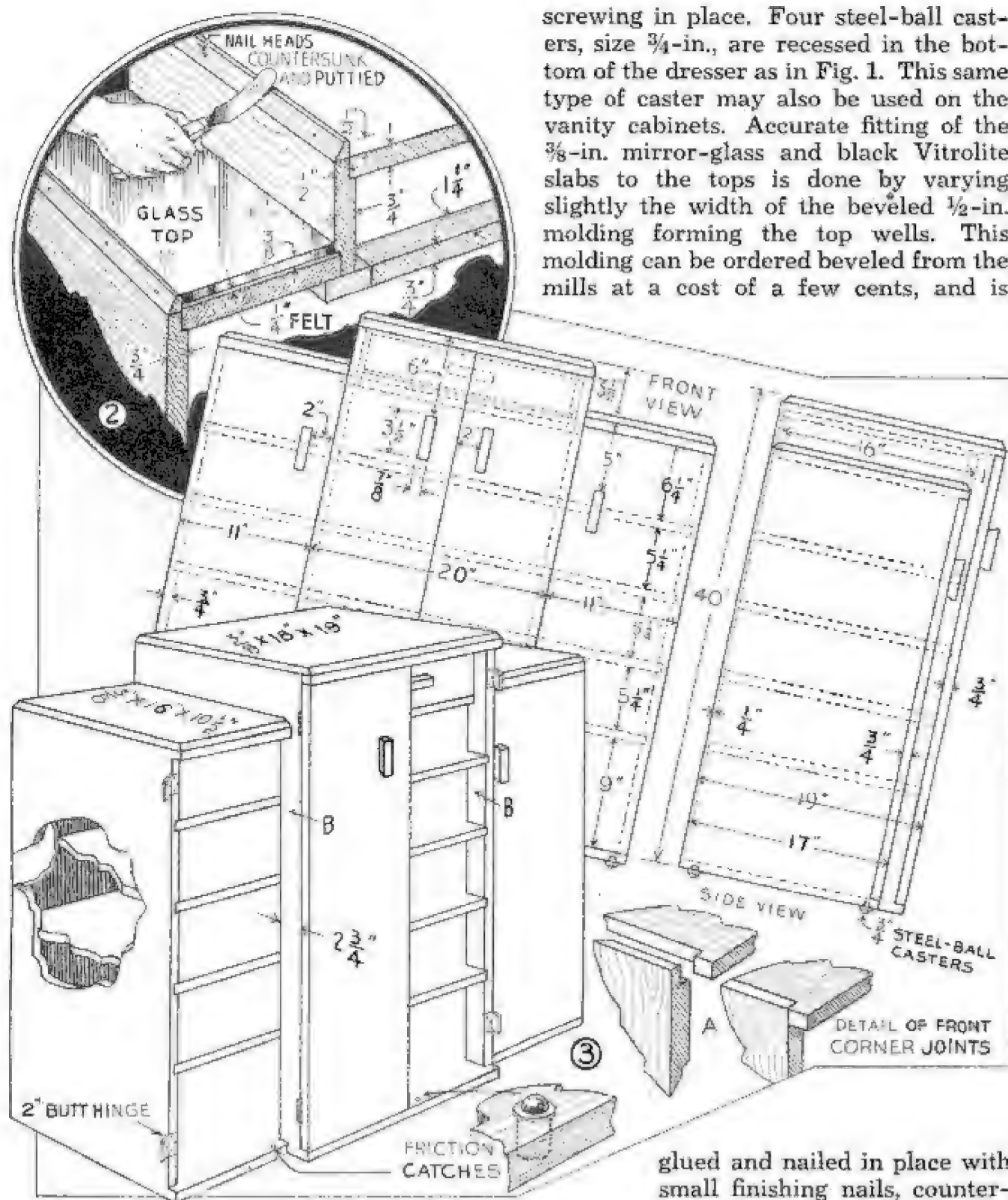
*Compact twin vanity
cabinets and dresser,
octagonal vanity seat
and double bed ----
all in the
Latest Modern Styling.*



cial cut of the front corners of the bottom and tops as shown at A, Fig. 3, glue together the bottom, sides, shelves and $\frac{1}{4}$ -in. plywood back. The back fits in rabbets, with the exception of its bottom edge which overlaps. Next, glue together the pieces that go to make up the terrace top, joining the parts as in the cross-section drawing, Fig. 2. It is a good idea to include the drawer slide in this assembly, for purposes of rigidity. Dowels or splines may be used to join the pieces of the drawer

slide, which is then screwed up against the bottoms of the risers and lower terrace tops. The two front stiles, B, Fig. 3, had best be inserted in place, after fitting and gluing the terrace-top assembly to the lower section. The stiles, B, are grooved to take the edges of the shelves, and are also joined to the front corners of the terrace top as at A, in Fig. 3, this joint being employed at the front corners of both dresser and vanity cabinets.

Building up the vanity cabinets is a simpler job. Dimensions and details for the right-hand cabinet are given in Fig. 5. It will be necessary to reverse these dimensions, side for side, when laying out parts for the left-hand cabinet. In each, there are two drawers that slide on guides nailed on the top shelf. The drawers pull

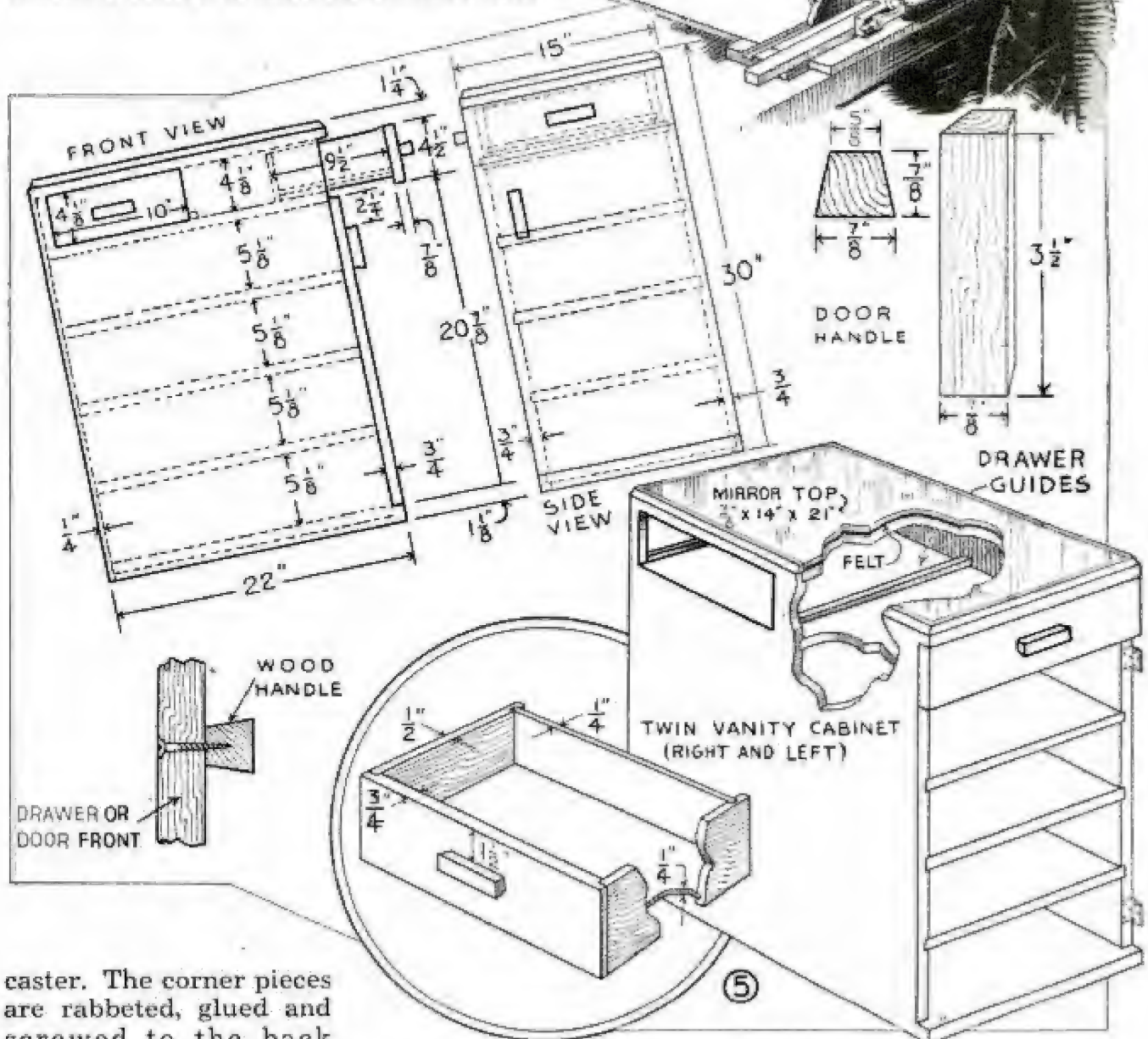


out of the fronts and inner sides of the cabinets. Fig. 5 gives dimensions for making the inside drawers of the vanity cabinets. Varying the dimensions to suit, this same construction can be followed in making the front drawers of the cabinets, and the one for the top terrace of the dresser. The drawer and door handles are cut to the shape shown in the upper right detail, Fig. 5. After being fitted, the handles should be sanded and finished before

screwing in place. Four steel-ball casters, size $\frac{3}{4}$ -in., are recessed in the bottom of the dresser as in Fig. 1. This same type of caster may also be used on the vanity cabinets. Accurate fitting of the $\frac{3}{8}$ -in. mirror-glass and black Vitrolite slabs to the tops is done by varying slightly the width of the beveled $\frac{1}{2}$ -in. molding forming the top wells. This molding can be ordered beveled from the mills at a cost of a few cents, and is

glued and nailed in place with small finishing nails, countersunk and puttied as in Fig. 2. It is advisable to specify "finished edges" when ordering the mirror-glass and Vitrolite slabs, to avoid chipping in handling. Finished edges will also permit the slabs to be dropped out of the wells without sticking. A layer of felt, $\frac{1}{8}$ in. thick, is laid under each slab to build them to the $\frac{1}{2}$ -in. level, and to serve as a cushion. The backboard of the bed is a rectangular frame made of $1\frac{3}{4}$ -in. square stock, and is covered, back and front, with $\frac{1}{4}$ -in.

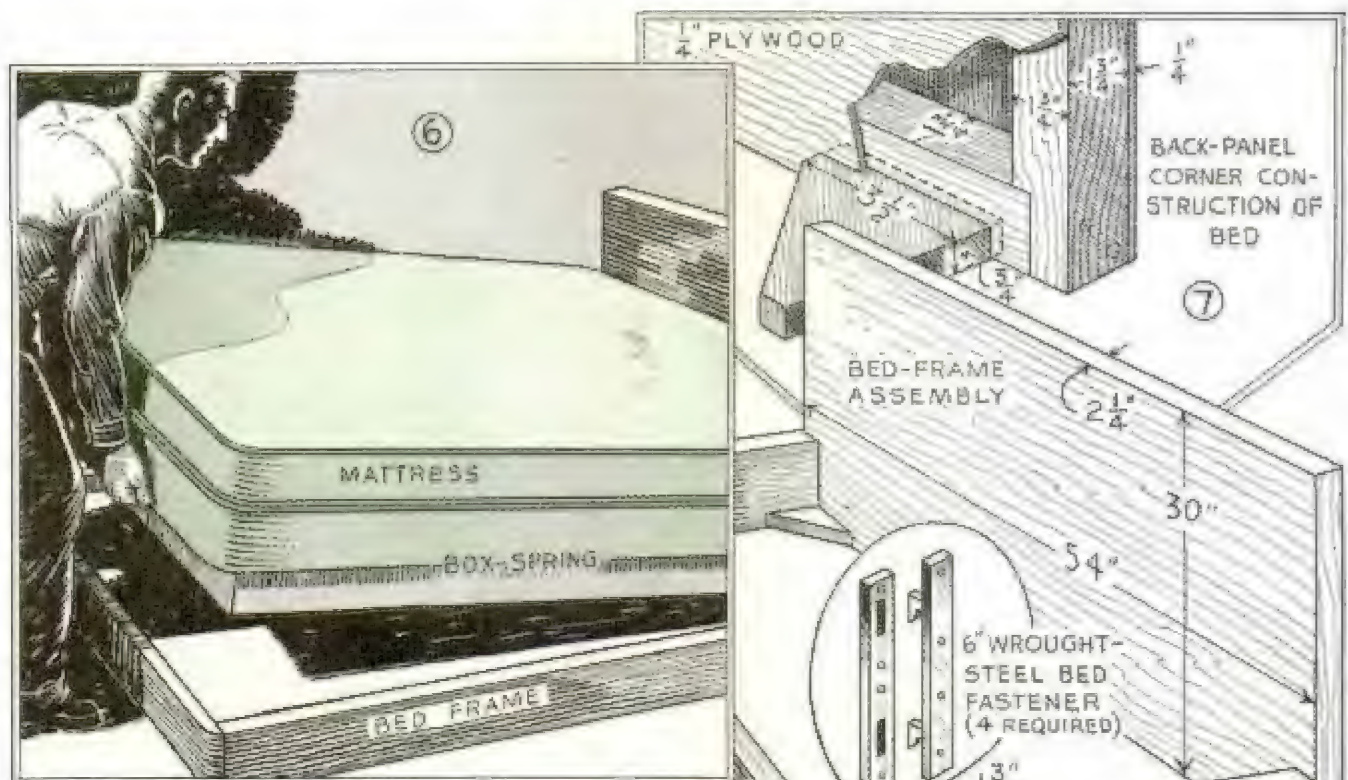
3-ply veneer as in Fig. 7. The front board and side rails are cut from $1\frac{3}{4}$ -in. stock to the dimensions given. In order that the bed can be set up or taken down at will, the corners are locked together with 6-in. wrought-steel bed fasteners, the halves of the fasteners being mortised in the ends of the side rails, and the back and front boards. Fig. 8 gives dimensions for the corner pieces. In each a hole is drilled to take a 1-in. steel-ball



caster. The corner pieces are rabbeted, glued and screwed to the back board and the front board, and serve as ledges on which the side rails rest. As dimensioned the frame will take a standard full-size box spring, of the type having a wood frame which lowers between the rails of the bed as in Fig. 6.

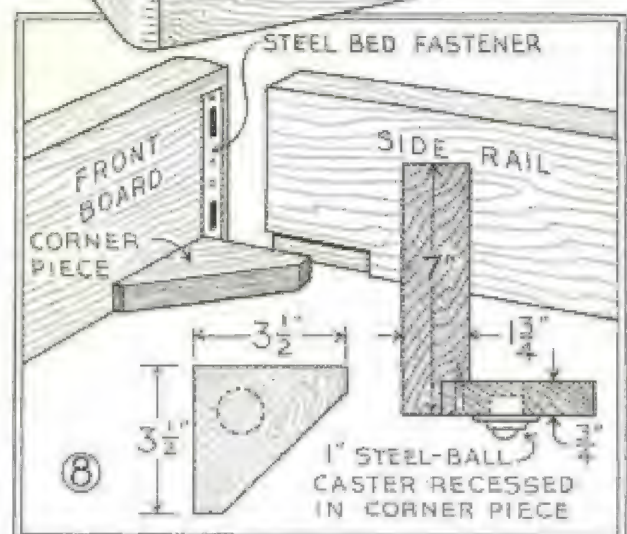
The $\frac{3}{8}$ -in. beveled plate-glass mirror is mounted on a lap-jointed frame having a center rail added for rigidity. Details and dimensions are shown in Fig. 10. It is wise

not to attempt to drill the holes necessary for mounting the mirror, as this job requires the skill and special equipment of an experienced glass worker. When mounting the mirror, extreme care should be exercised in drawing up the nuts on the bolts, lest they be drawn too tightly and crack the mirror. The two hanger brackets are fastened to the top rail of the frame on 16-in. centers, so that when the frame



is being hung the screws will turn into adjacent studs in the wall. It is also a good idea to rest the bottom of the mirror frame on the top edge of the baseboard. The mirror hanger bracket and ornamental bolts can be bought from any dealer handling cabinet hardware.

The octagon seat completes the vanity ensemble. First, cut out the eight side pieces from 3/4-in. lumber to the dimensions given in Fig. 11. These are rabbeted at both ends to receive the top and bottom. To glue together the eight sides, begin by first gluing and nailing the lower ends into the bottom. Then, with the removable seat cover serving as the internal top form, apply glue to the edges of the sides and clamp the assembly together using the arrangement shown in Fig. 9. This clamping arrangement consists of two loops of stout rope drawn tightly around the octagonal assembly, to which tension is applied with C-clamps. The base of the seat is built up of two additional octagons of graduated size, forming an offset. Holes, providing a grip for the hand, are cut through the removable cover of the seat, the interior of which makes a handy storage space. An octagonal cushion stuffed with kapok and covered with the same material used to make the bedspread and drapes finishes off the seat. Gliders may be driven into the base, to

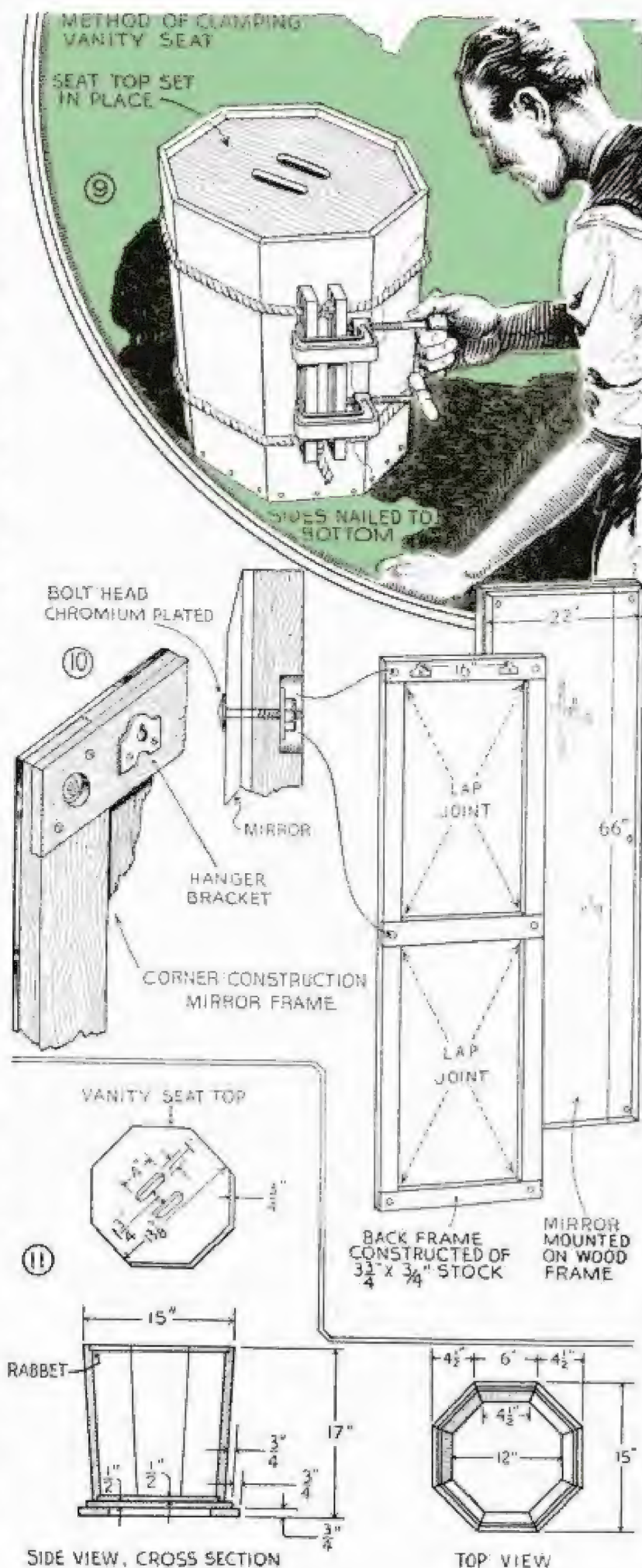


make it easy to slide the seat over the floor.

To put a smooth finish on the completed pieces, all surfaces should be dampened slightly by wiping with a moist cloth. Then while the grain of the wood is raised, rub down with fine sandpaper until all ripples are gone. This should be followed by two sanded coats of shellac, followed by a third which is left unsanded. This is followed by a coat of black brushing lacquer or black varnish which, when dry, is rubbed down with pumice and water. Follow this with two more coats of the same finish, rubbing down the final coat with a mixture of rottenstone and rubbing oil.

On a close-grained wood, this should produce a fine, satiny finish. However, if a still higher finish is desired, add more coats of lacquer or paint rubbed down thoroughly with pumice and water before applying the final coat. With the exception of the drawer sides and openings, which are only shellacked and waxed to avoid sticking, the interiors of the dresser and vanity cabinets are lacquered pale, lemon yellow. Two coats of shellac followed by two of the lacquer will suffice. The base trim on the vanity seat and the trim on all handles of dresser and cabinets are also pale lemon yellow, to establish a striking contrast. Other attractive color combinations can, of course, be worked out. If desired, a reversal of the color scheme, substituting oyster white for the black exteriors, black for the lemon yellow interiors and oyster white plastic for the black dresser top, would be equally effective as a paint job.

When made up into a bedspread, cushion cover for the vanity seat and as drapes for the windows, fabrics chosen from a wide selection of popular pastel colors, plain or striped, will prove a pleasing complement to either of these suggested finishes. Any plain neutral-colored rug, such as taupe or grey-green, will be found suitable for the floor. The walls of the room containing the bedroom suite illustrated were covered with pale green wallpaper having a fine design done in white and gold. The bedspread and drapes were made of rayon silk striped with three pastel shades of orchid. Twin frosted-glass tube lamps, of the open-top design with black-glass bases, threw a warm diffused light over the pale wallpaper, and were reflected in the French plate-glass mirror and mirror tops of the vanity.



Hinged Holder for Small Tools Fits inside Regular Box



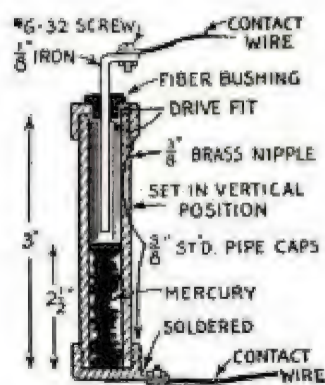
Small tools are always right where you can reach them if this holder is hinged to your toolbox

Hinged between the lid and top of your toolbox, this holder solves the problem of a place to carry small tools where they can be reached readily. The holder is made by cutting grooves in facing sides of two hardwood strips to take the tools and then gluing and nailing the strips together. The holder is hinged to the rear side of the toolbox, the partitions being recessed so that it will lie flush with the top of the box when closed.

—William Ferrary, New York City.

Mercury Thermostat for Home

For controlling small motors, fans and warning bells by temperature, you can make a simple thermostat from pipe and fittings. It is especially handy to install in the bonnet of a manually controlled furnace to sound a bell when the temperature gets too high. The thermostat is set to close an electrical circuit at any temperature by raising or lowering the $\frac{1}{8}$ -in. iron electrode at the top. If the thermostat is used where

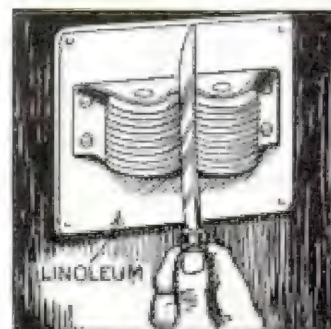


it is necessary to change its adjustment frequently, you can put it in a heated oven with a thermometer and scribe lines on the electrode to indicate the various temperatures at which it will operate.

Shield under Knife Sharpener Protects Woodwork

If you have a knife sharpener screwed to the woodwork near your pantry or kitchen stove, probably the wood is marred by having the knife slip off the sharpener.

To avoid this take a piece of linoleum or heavy celluloid and tack it under the sharpener as shown.



Shopping Bag Has Extra Pocket to Keep the "Want List"



To avoid loss or misplacement of her shopping list, and to keep it at hand when making small purchases, which she intends to carry home, one woman glued a paper pocket to the side of her shopping bag. The pocket

is of a depth that will leave the folded list projecting slightly for easy removal.

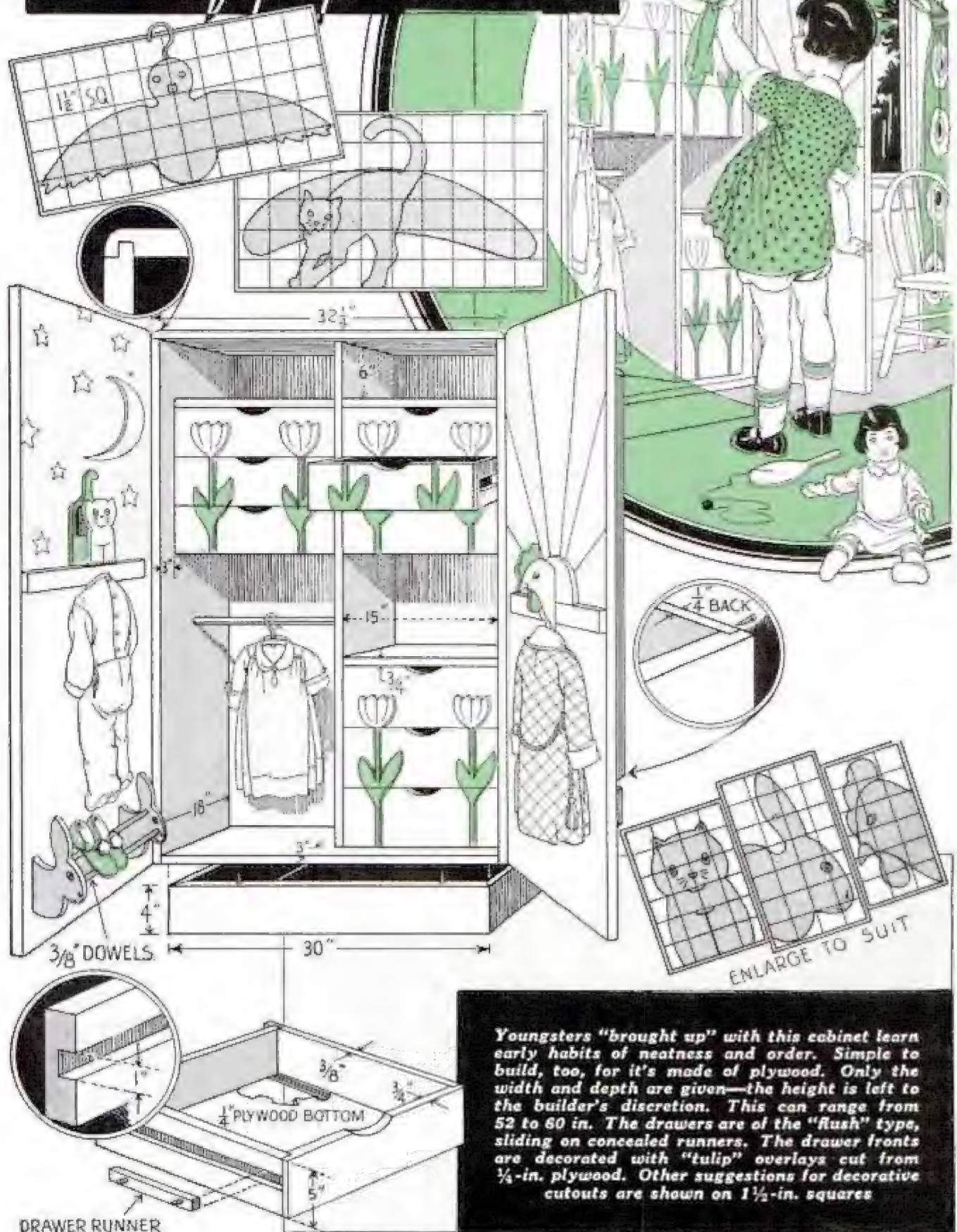
Artist's Brushes Held by Jacks

Amateur artists and card writers who haven't suitable holders for their small brushes when laid down temporarily, will find that two or three jacks, such as children play with, solve the problem. One leg of each jack is cut off as shown.

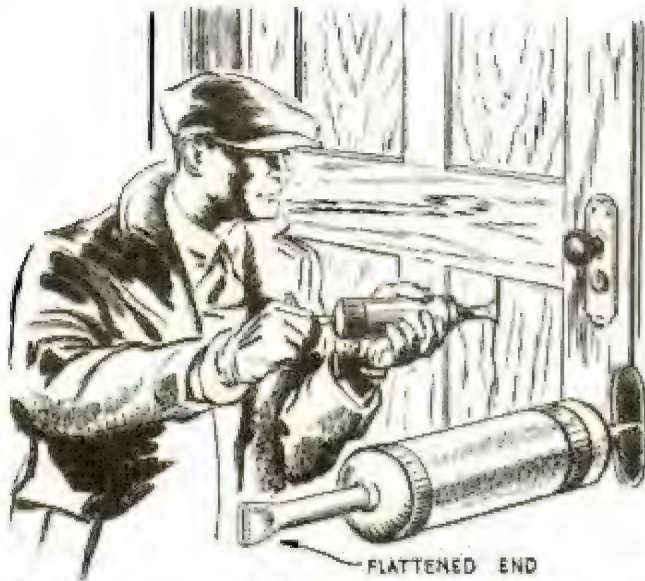


CHILD'S CLOSET

of plywood



Pressure Gun for Filling Cracks with Glue or Plastics



Cracks in wood and masonry filled completely with this gun to avoid undue shrinkage

By substituting a nozzle with a flattened end for the regular nozzle on an Alemite grease gun, you have a tool that will give a high pressure for filling cracks in wood with glue, for filling cracks in masonry with thin cement and for applying paste calking and flashing materials. If nozzles of different shapes are provided, you can apply plastics in almost any form desired.

Handy Pocket Oilers from Shells

Handy pocket oilers for use on guns, typewriters, fishing reels, etc., are readily made from metallic cartridge cases that



have been fired. Two good combinations are to use a .32-cal. automatic shell over the end of a .30-cal. U. S. army shell. Another is to use fired cases from a .45-cal. automatic over a .30-cal. U. S. army

shell that has been cut off at the enlarged portion just above the neck. Remove the primer from the short case and in the hole solder a finishing nail with the lower end flattened and pointed. The nail should be long enough to just clear the bottom of the long shell when the oiler is assembled.

—Earl B. Powell, Hollywood, Calif.

Flushing Clogged Soil Pipes

The problem of flushing soil pipes that have been clogged by leaves and trash from the eave troughs is solved by soldering a short section of pipe to the downspout as shown, so that a garden hose can be used. If you do not wish to do the soldering job, get a Y-shaped piece of downspouting from your dealer and install it at the top of the soil pipe. The open end of the pipe, of course, must be fitted with a removable cap to keep out dirt and leaves.

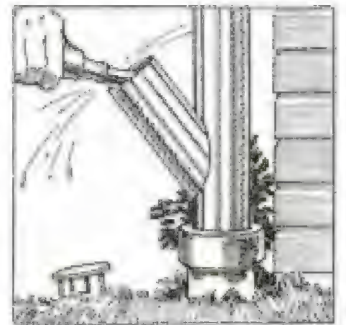


Table Printed on Exposure Meter Avoids Ruined Photos

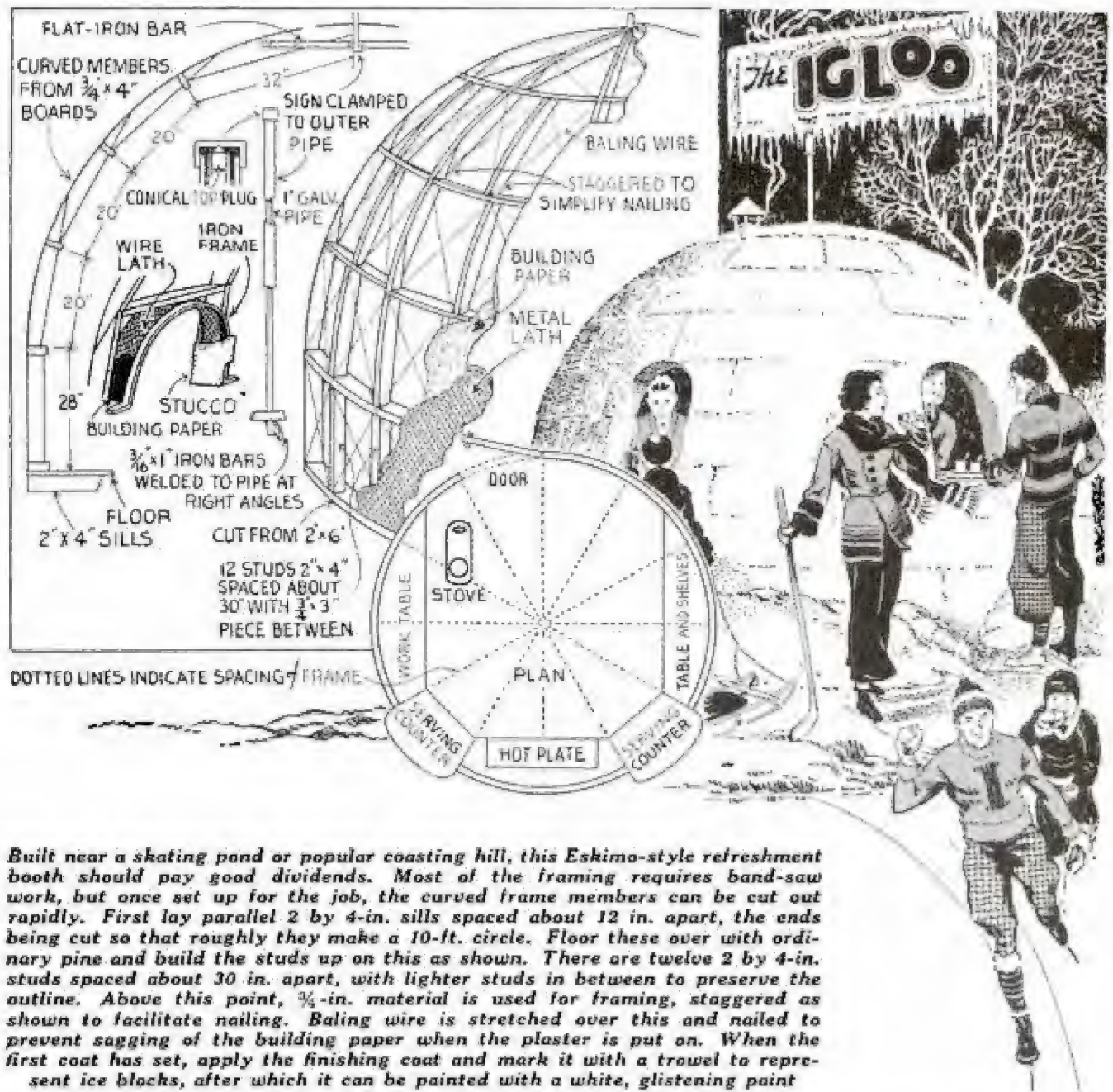
Having an exposure meter calibrated to the "F" system and a camera with U. S. stops, I often forgot to convert the meter reading to U. S. equivalent, which resulted in ruined photos. To avoid this trouble, I typed a conversion table on a slip of paper and glued it around the exposure meter as shown below. The table not only served as a reminder to make the conversion, but I could tell at a glance where to set the camera.

—Wilbur Ennis, Los Angeles, Calif.



Conversion table on exposure meter serves as reminder and shows at glance setting for camera

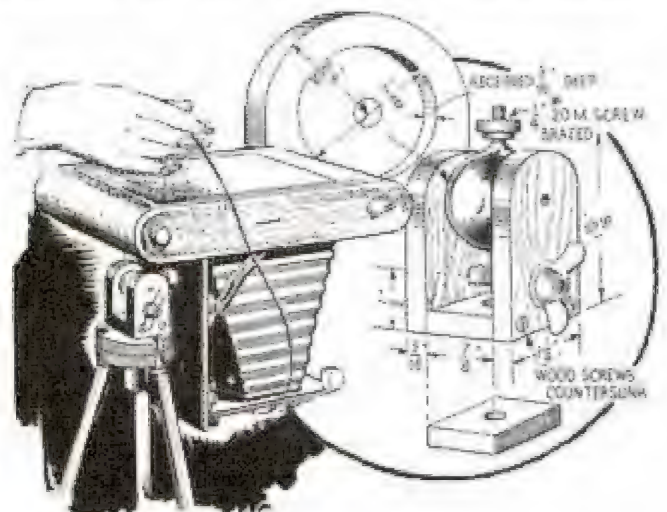
Winter Hot-Dog Stand Resembles Arctic Igloo



Built near a skating pond or popular coasting hill, this Eskimo-style refreshment booth should pay good dividends. Most of the framing requires band-saw work, but once set up for the job, the curved frame members can be cut out rapidly. First lay parallel 2 by 4-in. sills spaced about 12 in. apart, the ends being cut so that roughly they make a 10-ft. circle. Floor these over with ordinary pine and build the studs up on this as shown. There are twelve 2 by 4-in. studs spaced about 30 in. apart, with lighter studs in between to preserve the outline. Above this point, $\frac{3}{4}$ -in. material is used for framing, staggered as shown to facilitate nailing. Baling wire is stretched over this and nailed to prevent sagging of the building paper when the plaster is put on. When the first coat has set, apply the finishing coat and mark it with a trowel to represent ice blocks, after which it can be painted with a white, glistening paint.

This Tripod Head Swings Camera to Vertical Position

In addition to the usual features of a tilting tripod head, this one has the advantage of permitting the camera to be tilted to a vertical position. The head is made of well-seasoned maple, which is amply strong even for tapping a hole in the bottom to take the tripod screw. The pivot, which is a $1\frac{1}{4}$ -in. ball bearing, works in circular recesses in the sides. Attachment is made to the camera by means of a headless machine screw brazed to the ball. A nut soldered on the screw to leave five or six threads exposed, keeps it from entering the camera too far.





Model GAS-DRIVEN



Here's an exact scale model of a famous racing monoplane, "Mister Mulligan," winner of the Bendix Trophy and the Thompson Trophy races at the 1935 National Air Races. Recently the original speed plane set a new record in flying from Chicago Airport to Floyd Bennett Field on Long Island in 2 hours, 45 minutes. The model is scaled down to a wingspread of 66 in., and is driven by a tiny single-cylinder gasoline motor swinging a 15-in. propeller at 3,000 r.p.m. Under good flying conditions the model will attain a speed of approximately 18 m.p.h. The total weight of the model ship ready to fly is 3½ lbs., or 56 ounces

Part I—Fuselage Framework and Landing Gear

ALTHOUGH it was a great thrill to fly your first rubber-band model plane, it's nothing compared to the realism of flying a gas-driven model! Midget gasoline motors that develop from $\frac{1}{8}$ to $\frac{1}{2}$ hp. will fly readily a 5 to 8-ft. plane weighing up to 5 lbs. The average cost of the motor is about \$15.00 and all the materials needed to build the model of "Mister Mulligan" cost around \$3.00.

Before proceeding with any of the details, it's a good idea to become familiar with the entire general construction of the model. When the actual construction is

started, go thoroughly and completely in detail over the particular unit being assembled. Then lay out in single lines a full-size drawing of the fuselage, landing gear and tail wheel as in Fig. 1.

Fuselage: Looking at Figs. 2, 3, 4, and 8, begin with the center line which is the bottom longeron and which is the main longitudinal member in the body. One body height is given in the cross sections at station 5. This height continues through stations 6 and 7. From here through to station 12 there is a gradual taper above the center line. The top longeron tapers

No blueprints

PLANE ..

is speedy flyer

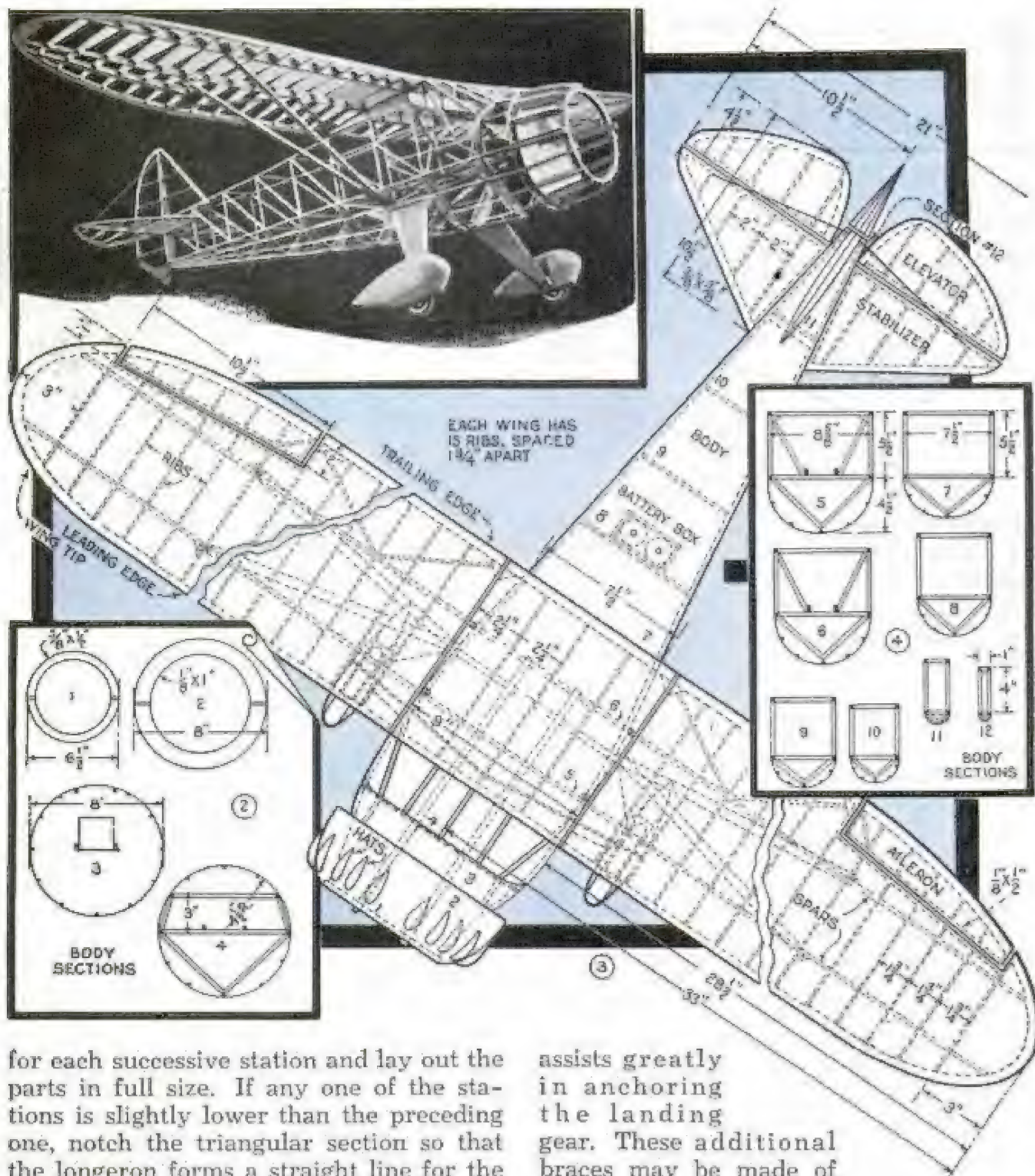


downward until it meets the given height of station 12. The distances between stations are given in the side view, Fig. 8. After the side view has been drawn, the construction can be started and the parts are placed directly over the drawn lines as in Fig. 7. Note that the heights for sections from stations 8 to 11 incl., are not given but must be checked on the full-size layout. The top and bottom longerons are placed in position, working directly over the center of the lines. Pin the longerons in place. When the uprights are fitted between the longerons they will tend to force the longerons against the pins, firmly holding them in position. Two sides exactly alike are constructed, one directly over the other, and separated with wax paper. This done, you make a full-sized layout of the top of the fuselage. Check the top dimensions at stations 5, 7 and 12. Draw the lines tangent to these dimensions, permitting the rest to fall in line. After the two sides are dry, place them right side up and pin in a similar manner to the board as specified for the side view. The cross



braces are cut and fitted first at the points dimensioned and then at those not marked. After the top and bottom cross braces have been cemented in, the main part of the fuselage is complete. When constructing a part be sure to refer to the parts list so that the proper materi-

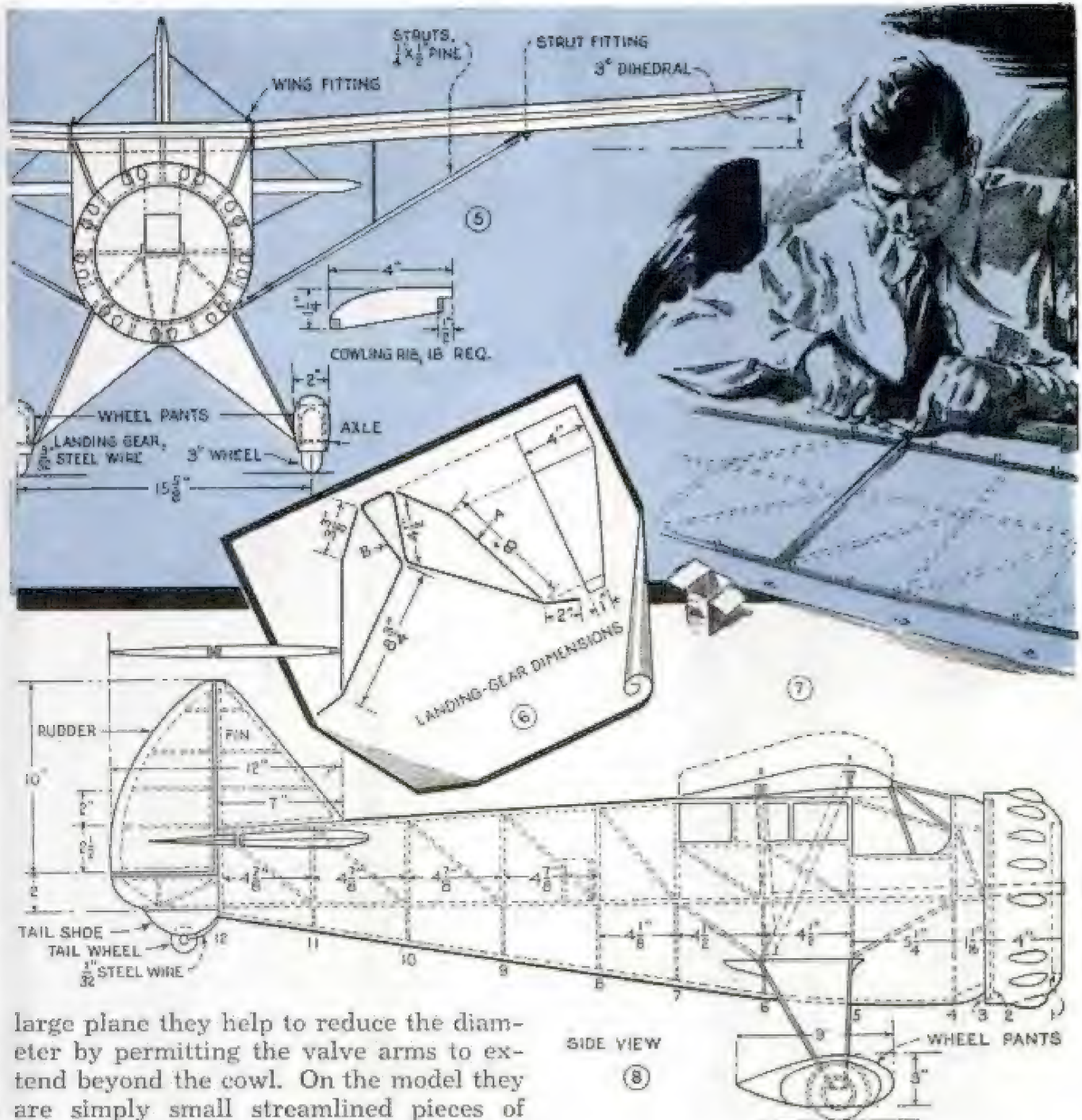
als are used. The body so far should have been constructed entirely from bass wood or sugar pine. Sand all pieces before cutting to exact length. Balsa wood can be used throughout for the construction, but for the additional few ounces of weight, pine or bass wood gives greater strength and resiliency. From the bottom longeron to the extreme bottom of the fuselage the construction will be $\frac{1}{16}$ -in. sheet balsa and $\frac{1}{8}$ -in. balsa bracing, with a center piece of pine or bass running the full length from station 4 to 12. Note that a triangular section is built up underneath each station and small semi-circular pieces are added to complete the circular shape of the underside. At points not dimensioned, check the distance across the lower cross brace, then draw a circle equaling this diameter



for each successive station and lay out the parts in full size. If any one of the stations is slightly lower than the preceding one, notch the triangular section so that the longeron forms a straight line for the greater part of the distance between stations 6 and 12 and a slight gradual curve between stations 4 and 6. The motor supports, which are $\frac{1}{4}$ by $\frac{1}{2}$ -in. pine, should be fitted in on top of the bottom cross braces between the two lower longerons. The distance between these supports will depend entirely upon the motor selected. After the motor mounts have been placed, check the views of the model and note that the triangular braces from the top station 5 to the motor brace are added on each side. An additional triangular brace is placed between stations 4 and 5, which

assists greatly in anchoring the landing gear. These additional braces may be made of balsa. A similar triangular brace is also placed on each side of the fuselage from the top down at station 6. This brace helps to eliminate side sway when the wings are in place. Additional bracing can be added by cementing small gussets in the corners on the main longerons at stations 4 to 7 inclusive. A gusset is a small flat triangular piece of balsa usually joining an upright, a cross brace and a longeron.

Motor Cowl: The small wooden streamlined sections cemented on top of the motor-cowl covering are hats and on the

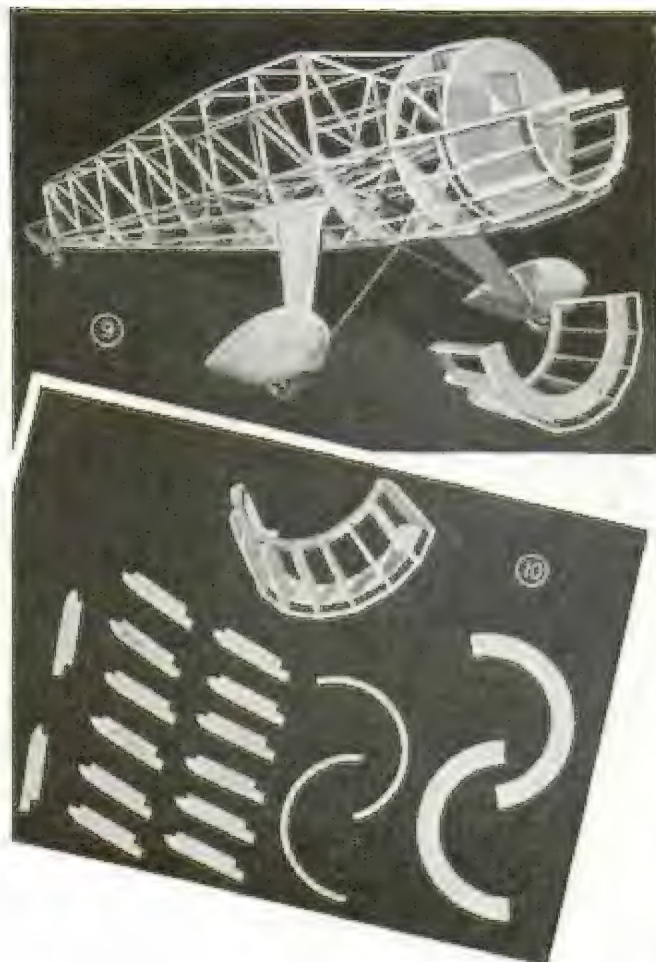


large plane they help to reduce the diameter by permitting the valve arms to extend beyond the cowl. On the model they are simply small streamlined pieces of balsa sanded to shape. There are 18 of these, equally spaced in pairs.

Stations 1 and 2 give the diameters and the cross-sectional sizes of the rings required for the motor cowl. Note in Figs. 9 and 10 that the front part of the body at stations 2 and 3 has a wall completely constructed of balsa wood. There is a small opening leading directly from station 3 to station 4 under the front of the windshield as in Fig. 2. This is a hot-air vent and is covered with balsa on all sides except the top. When the motor is entirely enclosed the hot air escapes through this vent. The motor cowl is constructed of two rings which are sawed from large flat sections of balsa, cemented together and assembled with 18 cowling ribs. The cowling is as-

sembled in two halves. The lower half is firmly cemented in position and is a part of the body. The top half is loose and is held in place by rubber bands and removes in a jiffy, permitting complete examination and checking of the motor, the gas tank and the spark coil.

Landing Gear: The landing gear, Figs. 5 and 6, is constructed of $\frac{3}{32}$ -in. steel wire. The unit visible in the side view, Fig. 8, is made in one piece, but note that you must have a right and left unit. The center section is also made in one piece and continues through the wheel pants. The landing-gear frame is filled with $\frac{1}{8}$ -in. balsa sheeting and is attached to the motor mounts between stations 5 and 6, where it



is braced in a triangular fashion to the front and rear of the longerons. The braces run from the motor mount to the landing gear at station 5 on both sides. At the rear they run between stations 6 and 7. The center piece fitted directly underneath the fuselage is held together by a rubber band, the strength of which may be increased or decreased until the proper spring action is secured. Wheel pants are carved from balsa to the size given in Figs. 5 and 8. The wheels used are 3 in. in di-

ameter, and from $\frac{1}{2}$ to 1 in. wide. You can use either pneumatic or solid wheels.

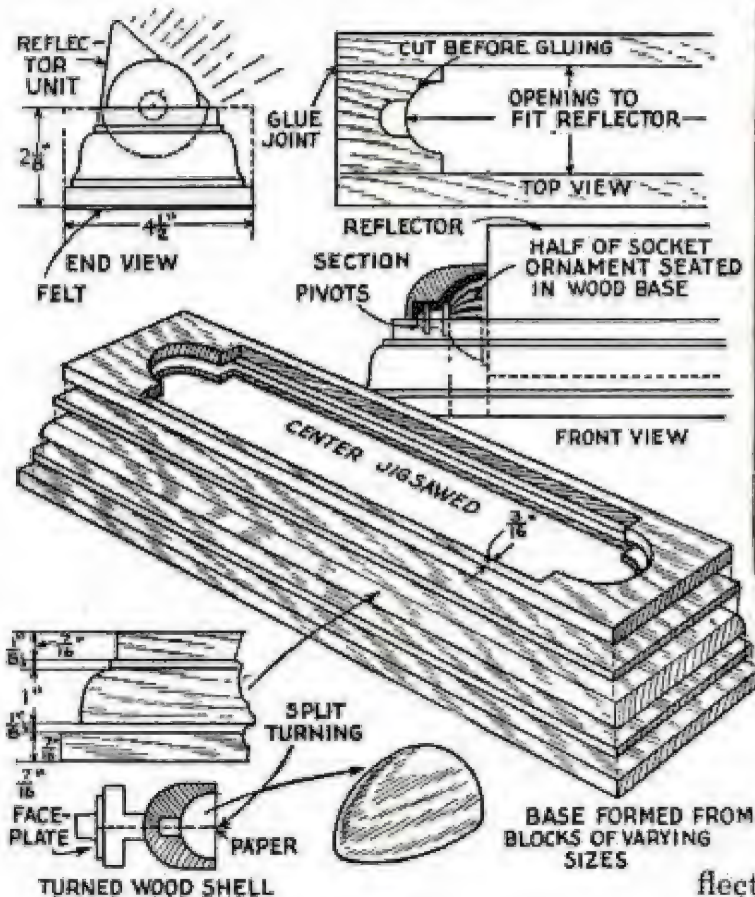
Rear Fuselage: The tail wheel is placed in a small shoe at the rear of the fuselage, the mounting being constructed from two pieces of balsa cemented to the rear of the body. A $\frac{1}{32}$ -in. wire passes through the center of the wheel and back to the upright at station 12. The wheel is 1 in. in diameter and is turned from hardwood. The small rigid section directly above the tail wheel is cemented in position and conforms to the general shape of the rudder. The width of the body at station 12 is 1 in., and the rudder rib at the lower end should conform.

(To be continued)

MATERIAL LIST

FUSELAGE	DIMENSIONS	NO. PIECES
Longerons, cross braces and uprights.....	$5/32 \times 5/32 \times 42$ in.....	12 pine or basswood
Cross braces	$5/32 \times 5/32 \times 42$ in.....	12 balsa
Motor supports	$1/4 \times 1/2 \times 18$ in.....	2 pine or basswood
Body formers	$1/16 \times 2 \times 24$ in.....	6 balsa
Stringers	$1/8 \times 1/8 \times 42$ in.....	12 balsa
MOTOR COWL		
Circular ring—front cut to shape.....	$3/8 \times 1/8$ in.....	1 set balsa
Circular ring—rear cut to shape.....	$3/8 \times 1$ in.....	1 set balsa
Cowling ribs	$1/16$ -in. sheet 3×24 in.....	1 balsa
LANDING GEAR		
Bracing and axle	10 ft. of $3/32$ -in. piano wire.....	1 steel
Wheels	$1/2 \times 3$ in. diameter.....	2 hardwood
Tail wheel	$3/16 \times 1$ in. diameter	1 hardwood
Wheel pants (cores)	$3/4 \times 4 \times 10$ in.....	2 balsa
Wheel pants (covers)	$1/8 \times 3 \times 7$ in.....	4 balsa
Landing-gear struts	$1/8 \times 4 \times 7$ in.....	2 balsa

Footlight Illuminates Painting over Mantel



Bathed in a flood of soft light, a picture or painting above your mantel stands out beautifully when illuminated by this decorative footlight reflector

Footlight reflectors, the latest innovation in picture illumination above a mantel, can be improvised easily by fitting the reflector from an old overhead type of picture lamp into an appropriate base of molded wood. Construction of the latter is more or less dependent upon the particular reflector at hand and must be made to fit accordingly. Double-bulb type re-

flectors generally have ornamental shells which cap the sockets at each end, and these are made to pivot in the base to permit proper angle adjustment. The base can be made by molding a roughly shaped, glued-up block on a shaper. Where such a tool is not available, appropriate moldings can be worked out by gluing together pieces of varying shapes and sizes. Lathe turned shells of wood are used to hide the partly visible ends of the reflector.

Siding Applied with Aid of This Gauge Is Equally Spaced

To assist in correctly spacing siding boards while applying them single-handed, one man used this homemade gauge. It consists of a short length of spring steel bent to the shape shown and riveted to a regular kitchen knife. The points at which the steel is bent will depend on the width of the siding being applied. In use, the knife blade is pushed under the last board nailed on, with the steel strip resting on top. Then the next board is put on, with the lower edge resting against the gauge.

☐ A few cheesecloth bags filled with moth balls and hung where sparrows are nesting will usually cause them to leave.



Coil Springs Are Quickly Made with This Wire Winder

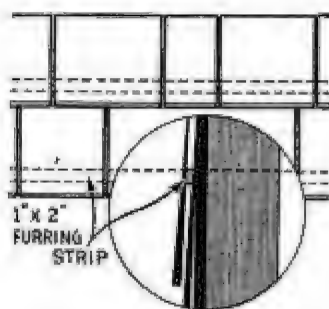


You can do a neat job with this winder, which has an adjustment to gauge the tension on the wire

To wind coil springs by hand, this simple winder will save work and enable you to do a neat job. Made from a length of flat iron, the winder is curved at one end to fit the contour of the mandrel on which the wire is being coiled, the wire being fed through two U-bolts, which are tightened to adjust the tension on the wire.

Life of Shingle Siding Increased by Use of Furring Strips

Instead of nailing shingle siding directly to the sheathing as is customarily done, it



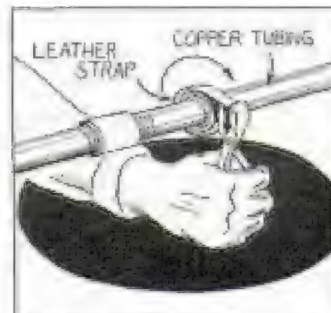
is claimed that a better method is to use 1-in. furring strips between them as shown. When shingles rest against the sheathing, soaking rains sometimes penetrate them

and wet the building paper, and, there being no air space between the shingles and sheathing, drying is slow and not uniform, which tends to cause the shingles to curl and even rot out quickly. With the fur-

ring strips, however, a 1-in. air space is provided which prevents moisture from reaching the paper and permits quick, uniform drying.

Disconnecting Copper Tubing

When copper tubing of 1/2-in. diameter or larger is threaded and screwed into a fitting, the job of unscrewing the joint may be accomplished without marring or crushing it by using a leather strap and a pair of pliers. The strap is wrapped around the tubing a few turns in the direction that the tube must be turned, and then the free end is grasped with the pliers as indicated. By resting the jaw of the pliers on the leather and applying steady pressure, considerable torque can be applied.



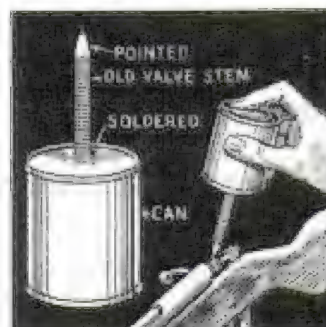
Chips Kept Out of Lathe Shaft



When doing chuck work and also some face-plate work in a lathe where the headstock center is removed, it is a good idea to plug the end of the lathe shaft to keep fine chips from entering the center hole. Such a plug is easily provided by turning a piece of wood to the same taper as the center.

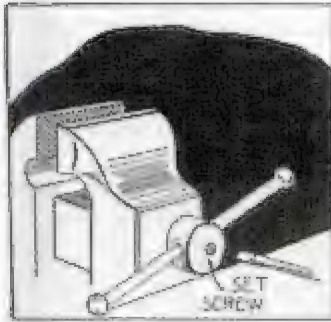
Improved Drop Oiler

For lubricating delicate machinery, guns, clocks, typewriters, etc., you can easily make an oiler that will accurately release one drop of oil at a



time. Remove the case from an old tire valve, and file down the end so that the core will project slightly when it is replaced. Then solder the valve in a hole in the bottom of a small can with a screw top or press-fit lid. When the can is filled with oil, just press the projecting core lightly against the part to be lubricated.

Handle of Vise Is Adjustable to Speed Opening of Jaws



On many vise jobs which require repeated opening and closing of the jaws, you will find that a handle which can be locked and spun around saves time.

To make the handle on the vise adjustable, just drill and tap a hole in the end of the vise screw to take a large set screw, which can be driven in to engage the handle.

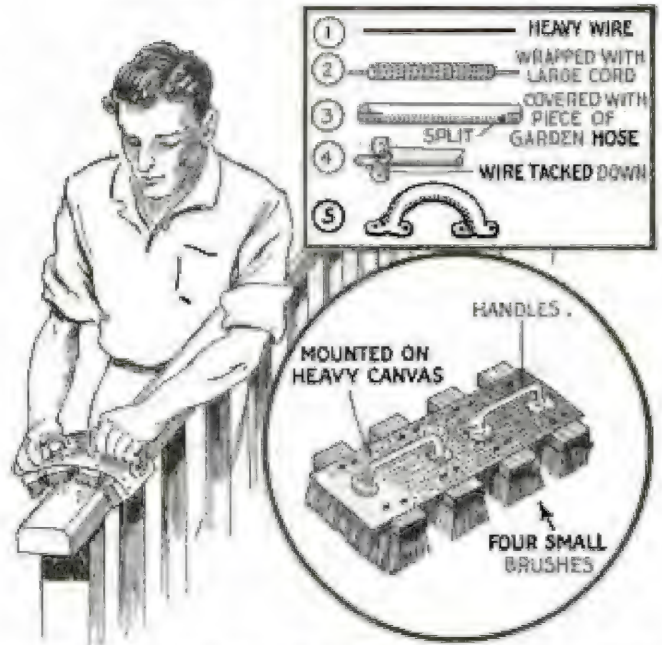
Angle-Handle Knife Cuts Steaks without Wrist Strain

For greater convenience in cutting steaks, one butcher finds that a knife with the handle bent to the angle shown is more practical than a straight one. Besides bringing the full length of the blade parallel to the cutting block, the angle of the handle prevents the knife from twisting in one's hands, thus relieving considerable strain on the wrist.



A knife with the handle bent to an angle gives full use of the entire cutting edge

Flexible-Brush Combination Cleans Curved Surfaces

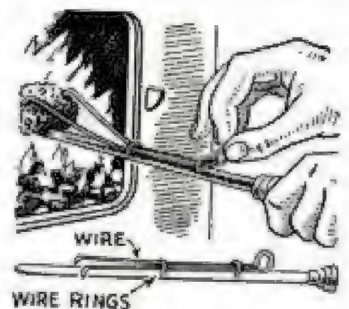


Porch and stair railings, round columns and similar work can be cleaned quickly with this assembly

In cleaning railings and similar curved work, this flexible brush assembly readily adjusts itself to almost any irregular surface. It is made by tacking a heavy canvas back to four or more equally spaced scrub brushes and providing the assembly with two flexible handles, made as shown in the insert. By substituting steel-wire brushes and making the back and handles of heavier material, you have an assembly for cleaning large pipes and similar work.

Furnace Poker Converted to Tool for Removing Clinkers

By simply drilling his furnace poker to take two metal rings through which a folded length of spring wire could be slid, one home owner made his poker serve the dual purpose of stirring the fire and removing the clinkers. Small hooks were bent on the ends of the wire, which was then curved upward a little to form open jaws. When the poker was slipped over a clinker, the wire was pulled back through the rings, which caused the jaws to grip the clinker.





Simple Methods of Solving Your

Home



For closing the crack between French doors and windows that connect to an unheated porch or have direct outside exposure, use strips of gummed sponge rubber. Both doors are then closed together. This material is also ideal to seal storm sash tightly



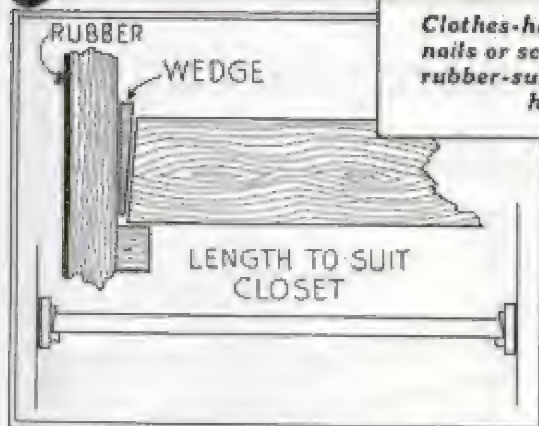
RUBBER STRIP

STORM SASH

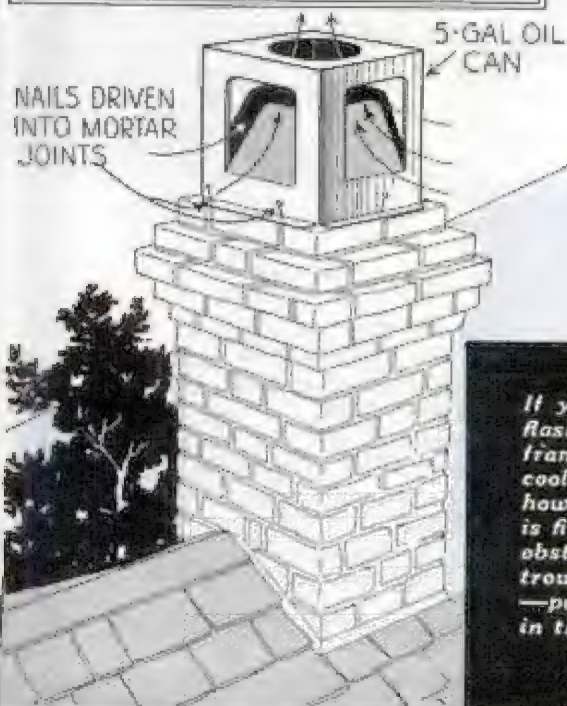
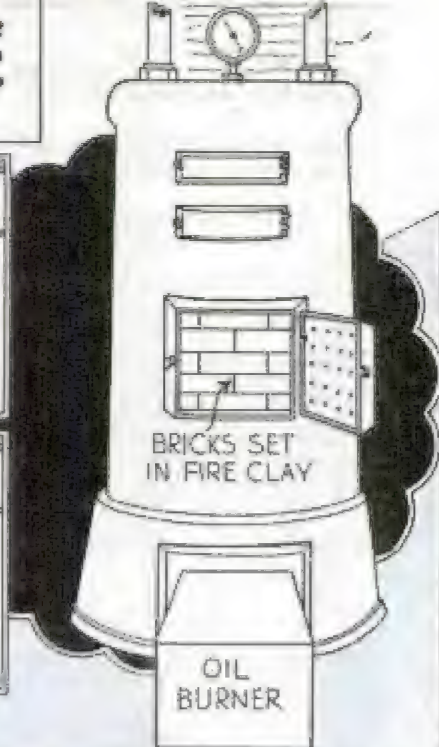
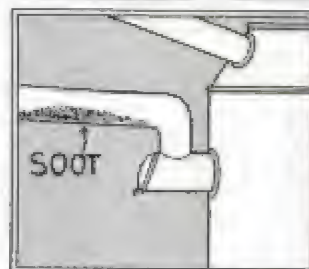


SPONGE-RUBBER STRIP

Problems

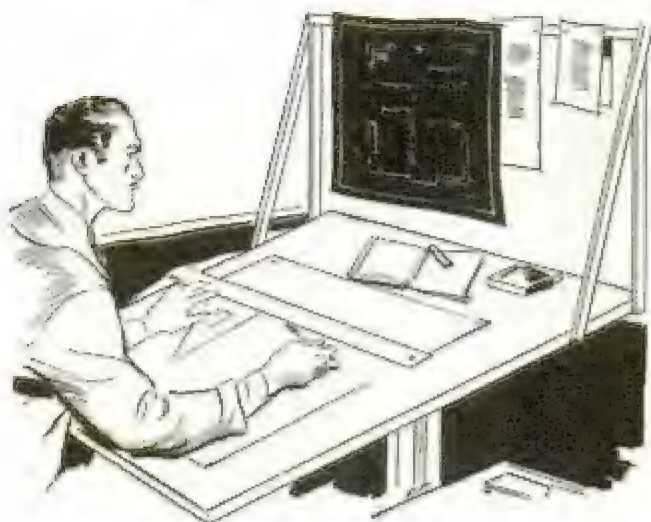


Clothes-hanger poles installed without nails or screws by wedging them between rubber-surfaced plates having cleats to help support the poles



If you can't keep paint on the door of a furnace fired with a flash heat, erect a heat baffle of bricks just inside of the door frame, setting the bricks in fire clay. This keeps the door cooler and the paint won't burn off. The center detail shows how increasing the pitch of a furnace smoke flue, where coal is fired, will prevent soot from accumulating in the flue, which obstructs draft and accelerates corrosion. And, if you are troubled with chimney down drafts, make a sheet-metal hood—perhaps an old 5-gal. oil can will fit—and cut it as shown in the lower left detail. Air currents will be deflected upward and out of the top, drawing the smoke up with them

Plans on Drafting-Table Rack Are Easy to Read



This rack holds blueprints and data sheets in front of the artist where they are easy to read

When copying details from architectural plans, and it is inconvenient to keep the latter on the drawing table, a wooden rack

rising from the rear edge of the table will support them so that they are easy to see. The rack can be made from four strips of wood and a dowel rod as shown. Tables of data and other material may be hung on the rack where they are instantly available.—P. Chandler, Nashville, Tenn.

Coil Spring Supports Funnel

When filling bottles or jugs with liquid, it's a good idea to support the funnel with a double-tapered coil spring from an old auto-seat cushion. This keeps the funnel from tipping and allows the escape of air.

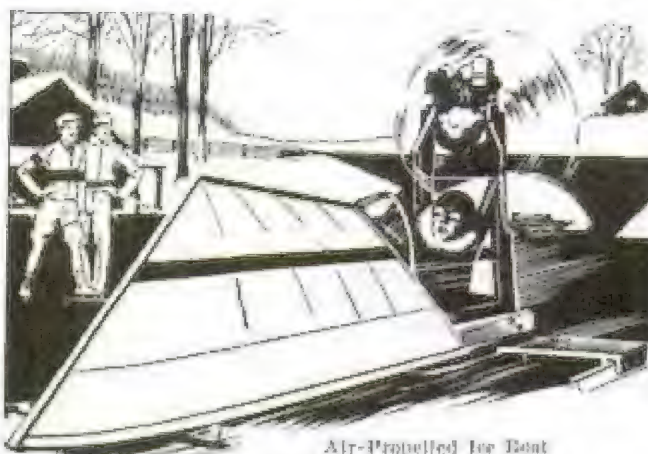


Ice Speedster Driven by Motorcycle Engine

An old motorcycle engine, a few dollars worth of lumber, bolts and flat iron is all you need to make this air-propelled speedster. Send 25c for blueprint 785 giving complete constructional details.

1937 "WHAT TO MAKE"

This 96-page Craftsman's Guide is just crammed full of practical information and valuable reference data for workshop owners. It not only suggests hundreds of items that you can make, but also tells where to purchase hard-to-get supplies. Will be sent postpaid on receipt of 15c.



Air-Propelled Ice Boat

OTHER SPORTCRAFT

- 18-FT. ICE BOAT—774: Roomy cockpit seats four people. 14-ft. mast, main sail and jib. 25c.
- FRONT STEERING ICE BOAT—786: 13-ft. cockpit. Single sail on 18-ft. mast. Safe. 25c.
- COASTING TOBOGGAN—657: 7½ ft. long by 16 in. wide. Includes data on bending slats. 25c.
- 8-FT. BOBSLED—632: Auto-type steering gear. Runner supports made from pipe fittings. 25c.
- HOMEMADE SNOWSHOES—796 and 797: Prints show how to bend frames, and string rawhide. Two prints 50c.

POPULAR MECHANICS MAGAZINE

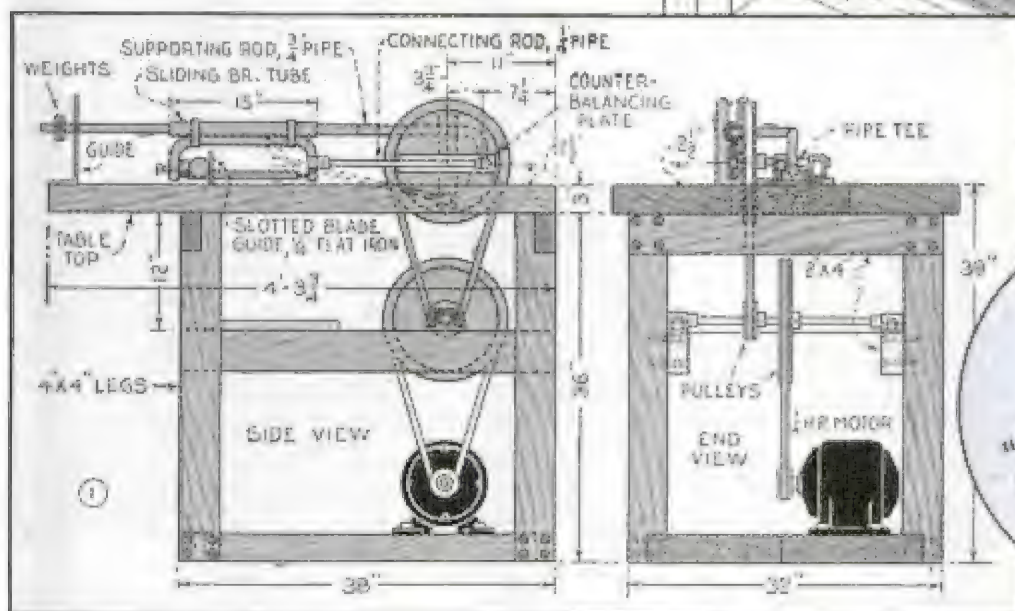
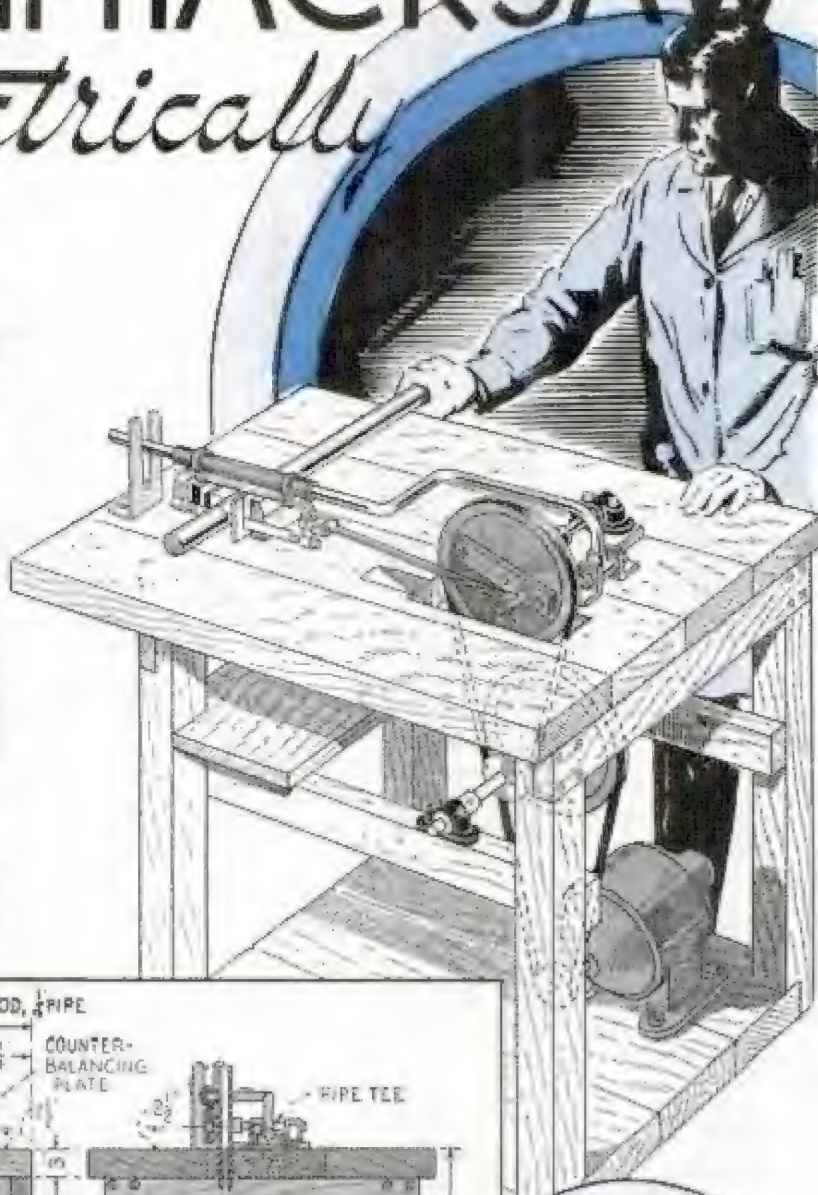
200 E. Ontario St., Chicago



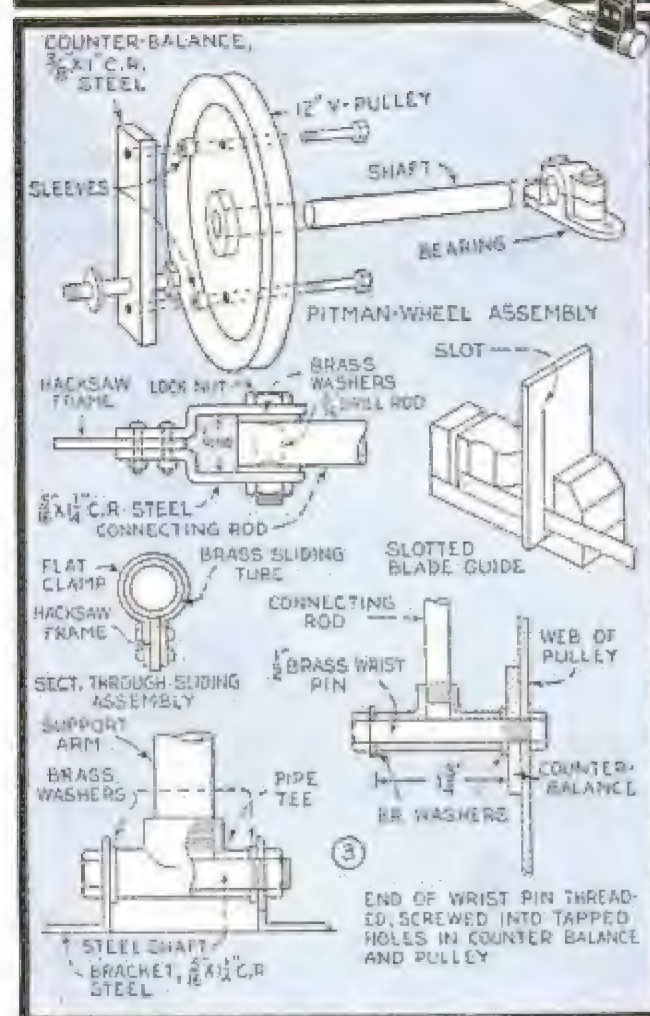
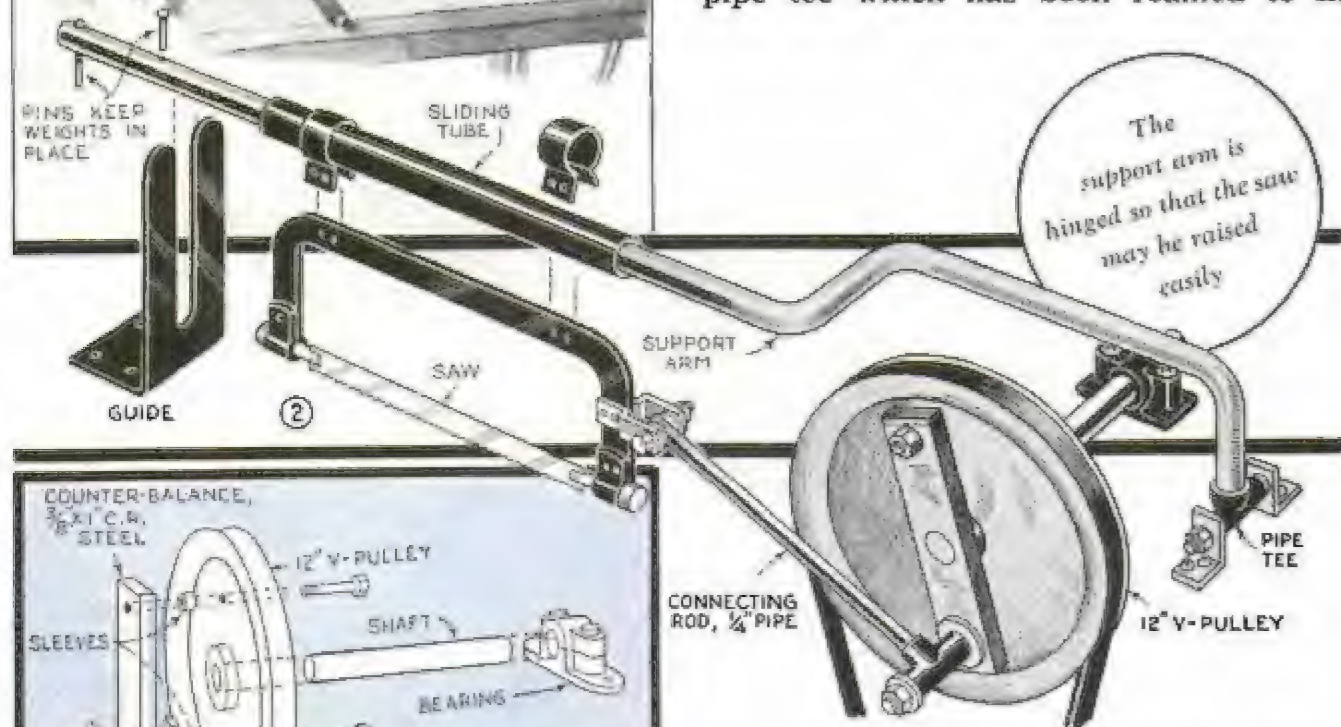
Drive Your HACKSAW *Electrically*

ANY ordinary hack-saw frame with the handle removed can be fitted to this simple drive unit, making an efficient power hack saw that will handle all kinds of light and medium work.

Fig. 1 shows side and end views of the table and gives you a general idea of the assembly. You don't have to be particular about the dimensions of the table. The main thing is rigidity and sufficient weight to absorb vibration of the reciprocating parts. A $\frac{1}{4}$ -hp. motor supplies the power through two sets of reducing pulleys, which brings the speed of the saw down to about 90 strokes per minute. The length of $\frac{3}{4}$ -in. shafting which



Any ordinary hand hacksaw can be used with this simple power drive. The saw frame is clamped to support arm, which is weighted.



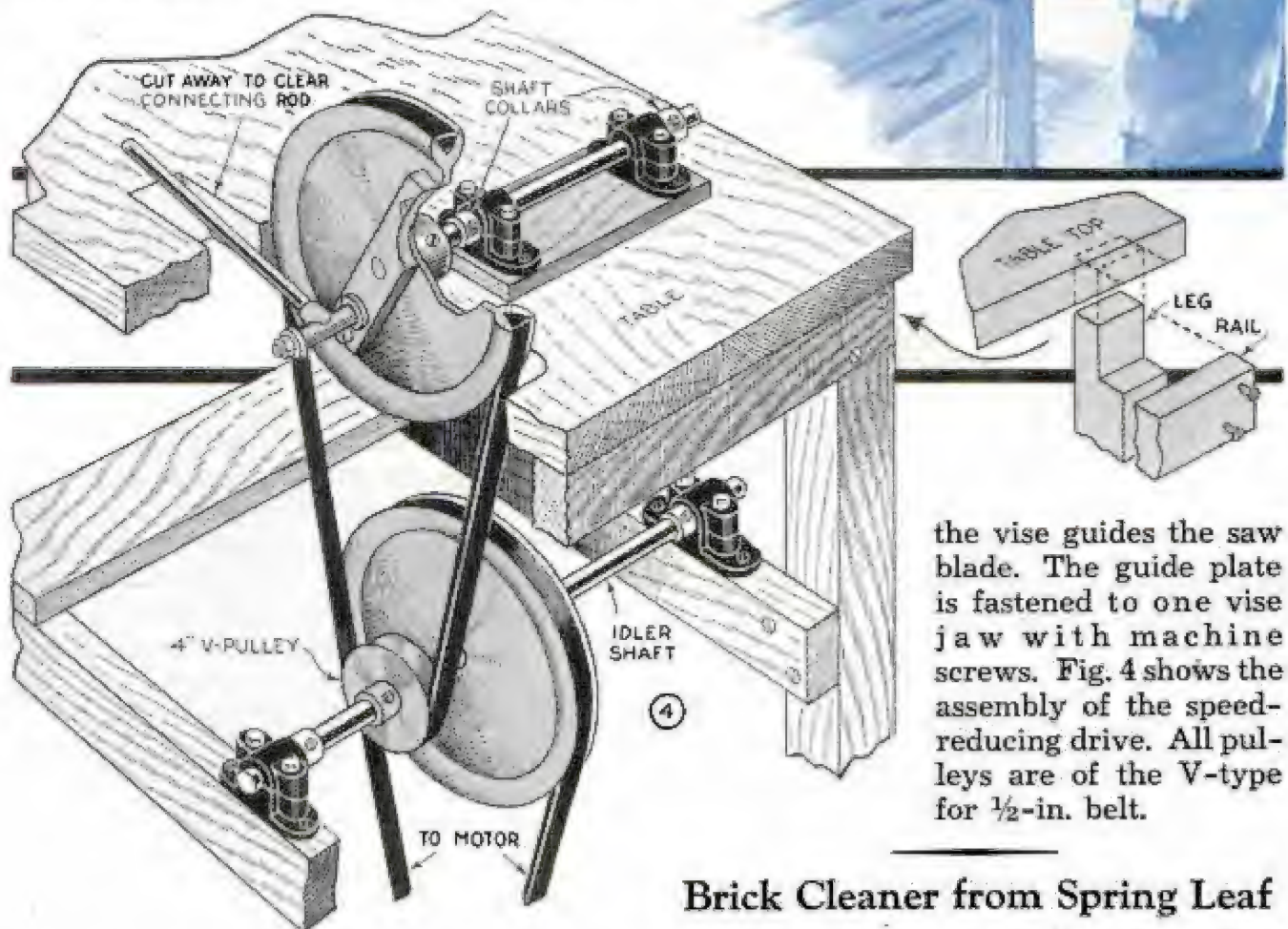
supports the intermediate and top pulleys turns in sets of $\frac{3}{4}$ -in. babbitted split bearings. Note that setscrew collars are used on each shaft. One face of the top or driving pulley is fitted with a counterbalancing steel plate as in Figs. 2 and 3. The counterbalance is bolted to the pulley. Construction of the crankpin is shown in Fig. 3, the lower right detail. A section of $\frac{1}{2}$ -in. brass rod is threaded on both ends and screwed into a tapped hole in one end of the counterbalance and through the pulley. This crankpin is secured with a nut at the back of the pulley. A $\frac{1}{4}$ -in. pipe tee which has been reamed to fit

serves as a driver for the connecting rod which is made from a length of $\frac{1}{4}$ -in. standard pipe. The forward end of the connecting rod is drilled for a $\frac{7}{16}$ -in. steel wrist pin threaded at both ends for lock nuts. The assembly is made as in Fig. 3. To guide the hack saw in a straight path, it is necessary to make a supporting arm either of $\frac{3}{4}$ -in. inside diameter iron pipe or brass tubing of the same size. Figs. 2 and 3 show the method of fastening this arm to the table. A $\frac{1}{4}$ by $\frac{1}{4}$ by $\frac{3}{4}$ -in. pipe tee is used as the moving part of the bearing. The tee is reamed out to fit over a $\frac{1}{2}$ -in. steel shaft. It is necessary to make an S-shaped bend in the arm as in Figs. 2 and 3. The best way of making the bend is to fill the $\frac{3}{4}$ -in. pipe with sand and place caps on each end, heat to a dull red and bend carefully in a vise. Brass tubing

can be bent cold. The surface of the pipe which supports the hack-saw guide should be polished smooth. The slide is a length of brass tubing which will telescope over the polished section of the supporting arm. The hack-saw frame is fastened to the guide with the aid of clamps as in Fig. 2. These can be riveted to the saw frame or held with small bolts.

The pressure applied to the blade when cutting is regulated by weights on the outer end of the supporting arm as shown in Fig. 1. These weights can be made by drilling a hole in cold-rolled steel plate of such a size that the piece will slip easily over the pipe. Setscrews or pins can be

By filling the tubing with sand and plugging the ends you can bend it easily



the vise guides the saw blade. The guide plate is fastened to one vise jaw with machine screws. Fig. 4 shows the assembly of the speed-reducing drive. All pulleys are of the V-type for $\frac{1}{2}$ -in. belt.

used to hold the weights in place. Different materials require slight variations in blade pressure for the best cutting action. The support-arm guide, Fig. 3, can be made from $\frac{1}{4}$ -in. flat iron, the slot being of the same width as the diameter of the pipe. If necessary, the guide should be blocked up on the bench, so that the arm will reach the bottom of the slot just as the saw breaks through the work.

A standard toolmakers' vise can be used to hold the work. A slotted plate fitted in

Brick Cleaner from Spring Leaf



Sharpened at opposite edges near one end, a short leaf taken from an old auto spring will provide a convenient tool for removing mortar from old bricks. Taping the unsharpened end provides a comfortable handle.

Window Display Is Operated by Shoppers from Street

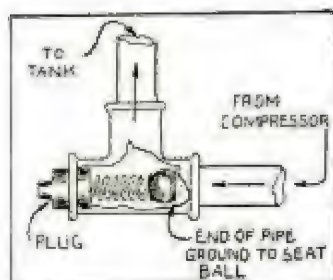


By turning a wood disk projecting from the wall, shoppers can rotate this window display

Operated by shoppers from the street, this pivoted cone, which displays articles in a show window of a jewelry store, attracts considerable attention. The lower end of the cone standard rests in a ball-bearing socket, and is belted to a wood disk set horizontally in the wall so that the edge projects within easy reach of the shoppers. A disk of smaller diameter than the one projecting from the wall, takes the belt and is screwed to the side of the larger one. The entire mechanism is hidden under the floor of the show window.

Making Emergency Check Valves

On a rush job of installing a compressed-air outfit where check valves for the air line were not available, some were quickly assembled from pipe fittings, ball bearings and small coil springs. A wrought-iron tee served as the body of each valve. The end of the pipe against which the ball rests between strokes was ground to a perfect seat with a ball having a shank brazed on to it to fit a hand drill. A glue-



and-emery mixture was used for grinding. As the valves were made of $\frac{3}{8}$ -in. pipe, balls of $\frac{7}{10}$ -in. diameter were obtained for the checks. A length of spiral spring and a pipe plug completed the assembly.

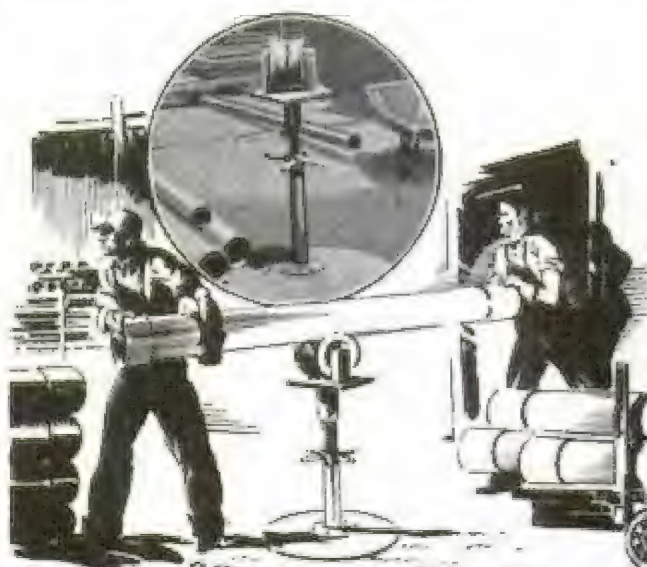
Tightening Hairs of Art Brushes

Sign and show-card writers who use cheap brushes for some of their rough work, can keep the hairs from coming out by cementing them tightly inside the brush ferrule. This is done by drilling a small hole in the latter and applying a drop of collodion.



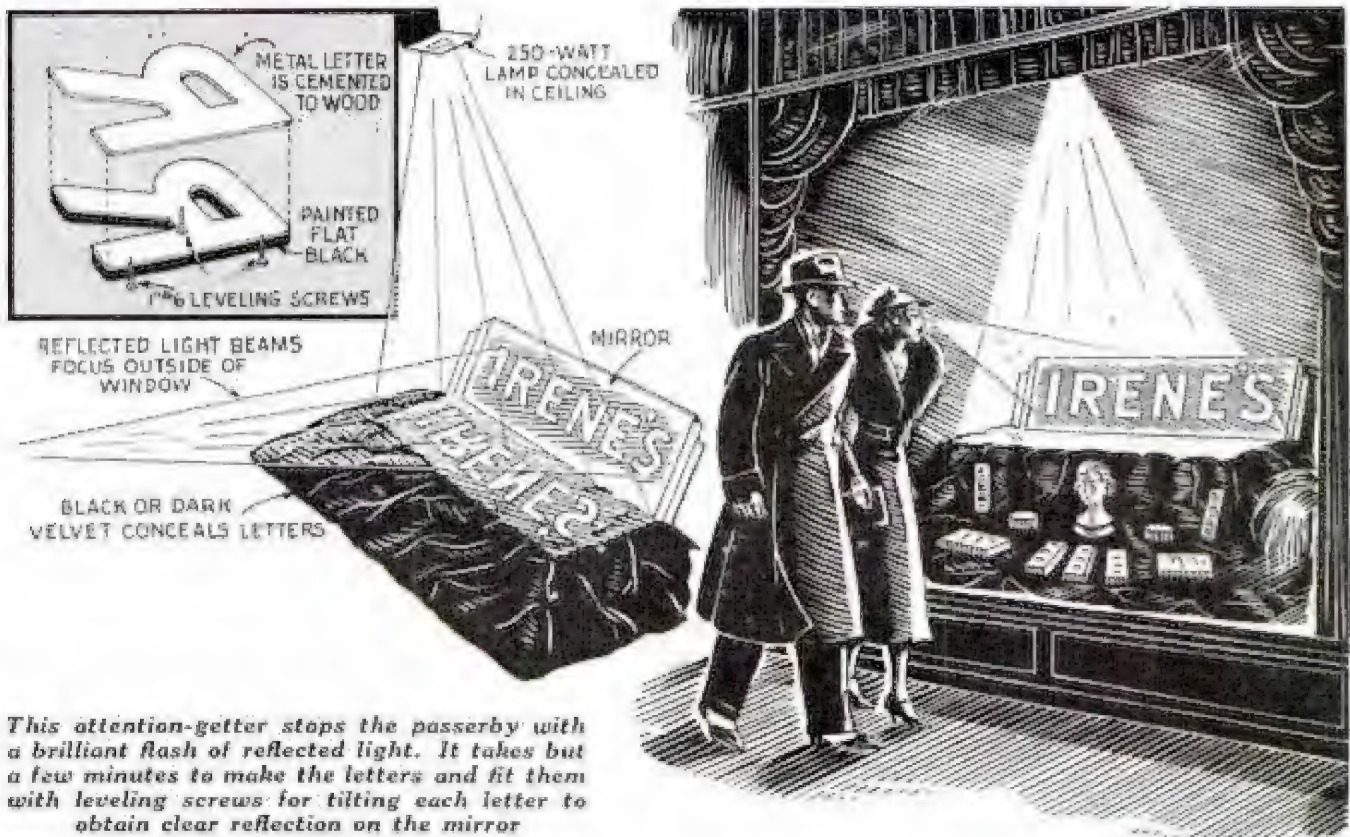
Handy Roller in Material Yard to Move Heavy Work

In material yards and other places where heavy pipe, shafts, etc., are handled, this adjustable roller will come in handy. The roller consists of two small car wheels mounted on an axle with the flanges to the outside, the axle being supported between two pieces of heavy channel iron, which are welded vertically to the top surface of a piece of plate iron. This is welded to the usual type of threaded post screwing into a pipe support. A large, round base makes the device stable.



This roller is readily adjustable to any height to assist in piling or unloading heavy work

Flashing Window Sign Has No Moving Parts



This attention-getter stops the passerby with a brilliant flash of reflected light. It takes but a few minutes to make the letters and fit them with leveling screws for tilting each letter to obtain clear reflection on the mirror.

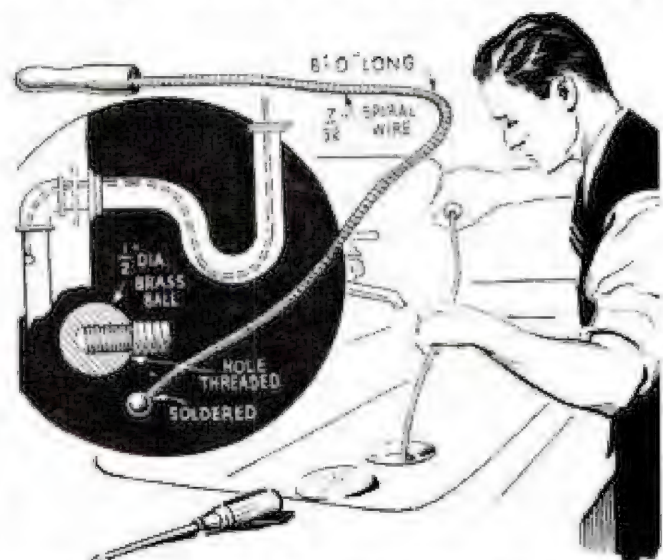
Prospective customers will be sure to stop in front of your store to figure this one out. Large letters in reverse are jigsawed from hardwood, are faced with chrome-plated sheet metal and then each letter is fitted with three leveling screws. The letters, spelling your own name or that of some special product, are arranged on a base in the center of the window and

hidden from the street by folds of velvet. Back of this is placed a mirror. The light from a 250-watt bulb concealed in the ceiling shines on the letters which are placed so that the reflection is cast onto the mirror and from there to a point outside the window. The attention of the passerby is arrested by a brilliant flash of light from the letters.

Spiral Drain Cleaner with Ball Tip Feeds into Pipe Easily

If you have had difficulty in getting a spiral drain cleaner to feed into a drain pipe, the trouble was probably caused by the end of the cleaner catching on the edges of the pipe at the joints. This trouble can be eliminated quite easily by drilling and tapping a $\frac{1}{2}$ -in. hole in a brass ball so that the end of the cleaner can be screwed into it and then soldered. The ball will offer a smooth, rounded point so that the cleaner can be inserted easily regardless of turns and angles of the drain.

☞ If an electric radiant heater is focused on work to be put together with hot glue, the heat will prevent the glue from chilling quickly and allow slow, careful joining.

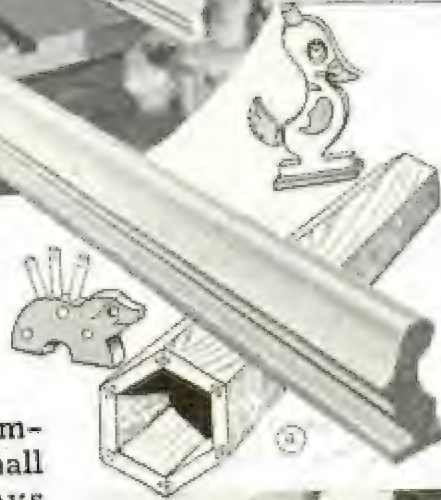
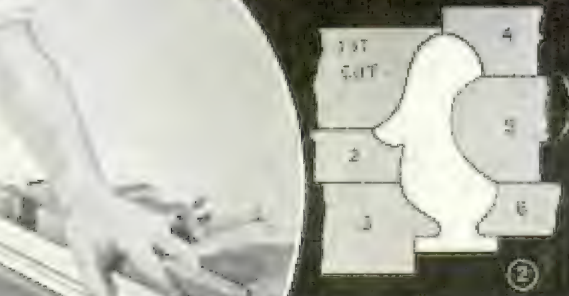


Your spiral drain cleaner won't catch on pipe walls when a ball is put on the end

Try These



THERE are many workshop operations that can be accomplished conveniently on a shaper. A typical example is the making of small cutout figures for toys and novelties, a sample figure being the duck shown in Fig. 4. This novelty is worked on the shaper in a long strip, as in Fig. 1, blank knives being ground to the prop-



er contour to make the cut, as in Fig. 2. However, very good results can be obtained with standard knife shapes, the figure used in the example being cut in ten passes, using six standard shaper knives. After shaping, you saw off the pieces to the required thickness, as in Fig. 3. Figures up to about 6 in. square can be worked readily in this manner.



Using a straight knife and the simple bevel jig shown in Fig. 5, any form of column work can be done easily on a shaper. The jig consists of a fixed base which is slotted to permit fastening to the table studs. The movable portion is hinged to the base, and fitted with an index arm so that it can be clamped at any angle. While the cut shown is simply a straight bevel, tongue-and-groove work can be done by using the proper cutters.

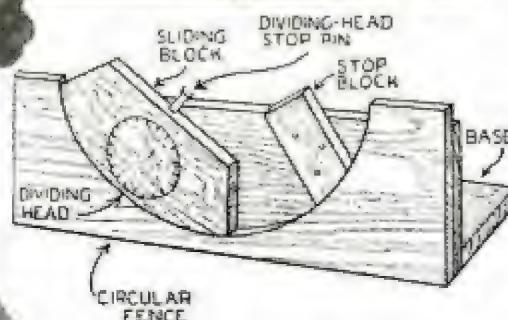
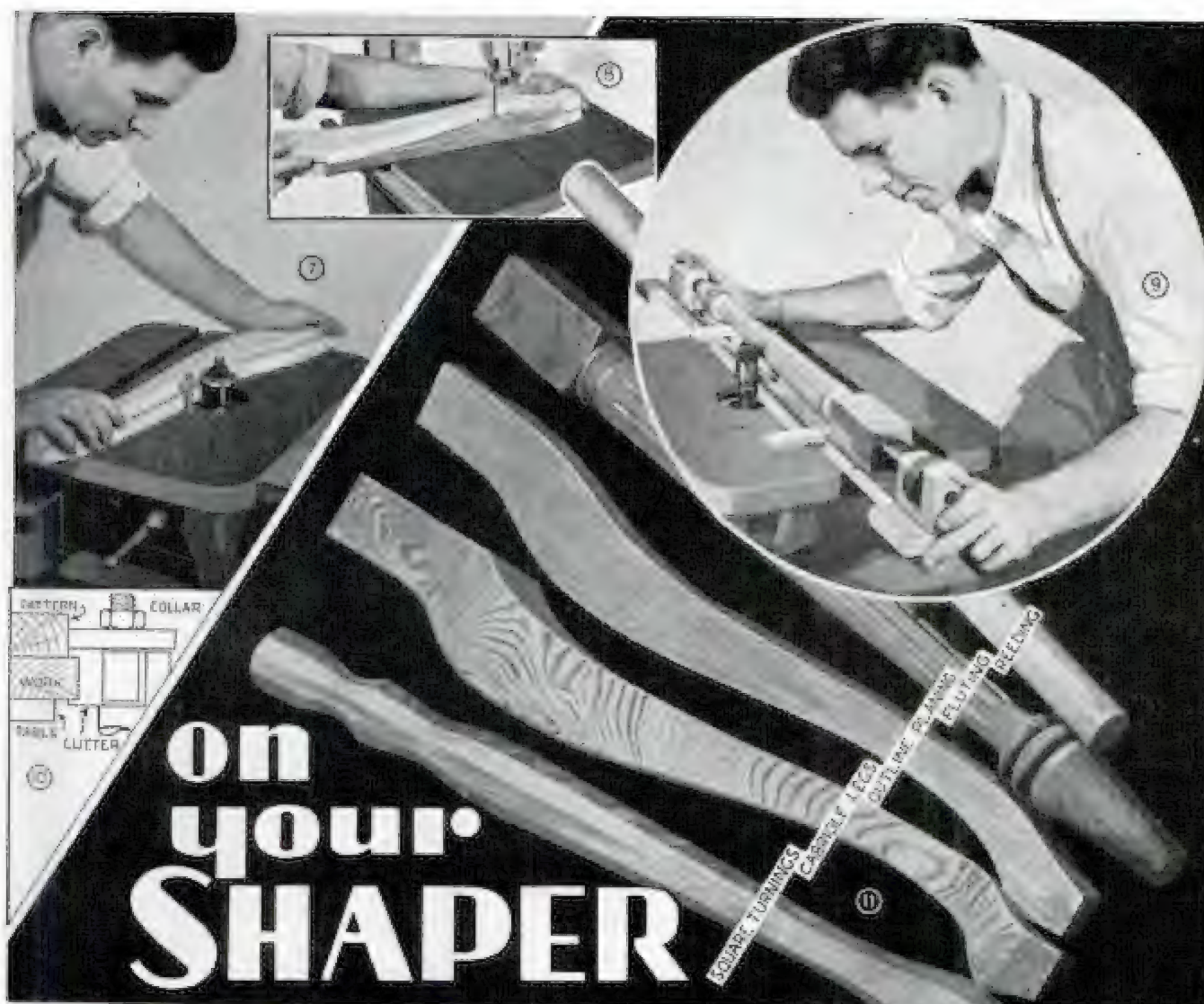


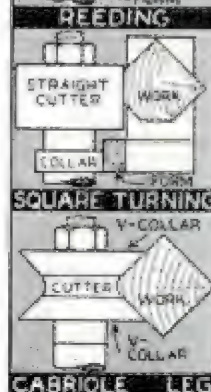
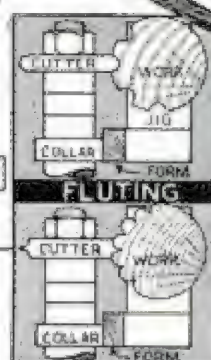
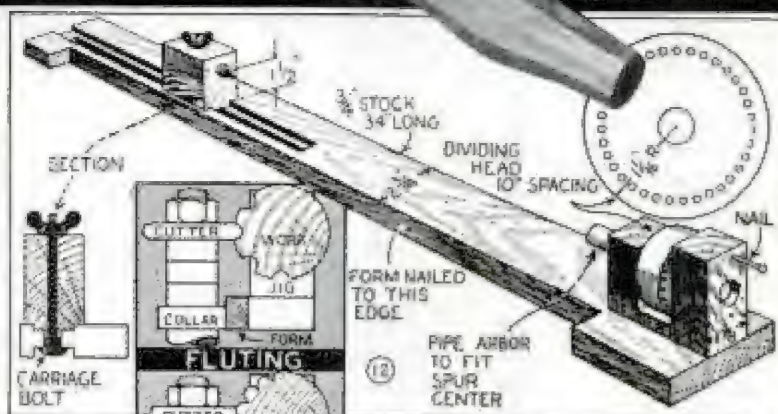
Fig. 6 shows a radial rosette and also pictures the shaper operation and the dividing head. The jig consists of a circular fence fitted onto a suitable base. On the fence is a sliding block, and housed in the sliding block is a simple dividing head. In operation, the work is fastened to the dividing head, and successive radial cuts

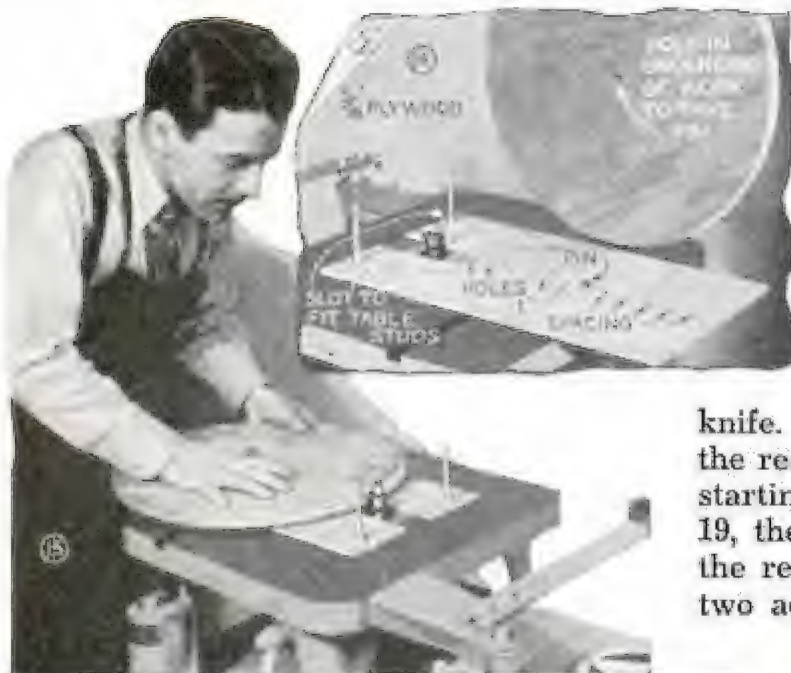


at the various settings are made. You use a reeding cutter on the spindle for this work.

The shaper is also adapted to the fashioning of a variety of furniture legs, as in Figs. 8 to 11. One of the most popular is the cut-out leg, made from flat stock. A pattern of this leg is first made up and carefully sanded. This pattern is then bradded to the wood stock and the surplus lumber cut away on a band saw, as in Fig. 8. Now, with a straight cutter on the shaper spindle and a collar of the same diameter as the cutter to ride the pattern, the rough-sawed work can be shaped quickly to a perfectly smooth-edged duplicate of the pattern, as shown in Fig. 7. The edge requires no sanding.

Fluting, reeding and chamfering are done with a simple fluting jig, as in Figs. 9 and 12. In use, the work is centered in the jig, and a form of the same contour as



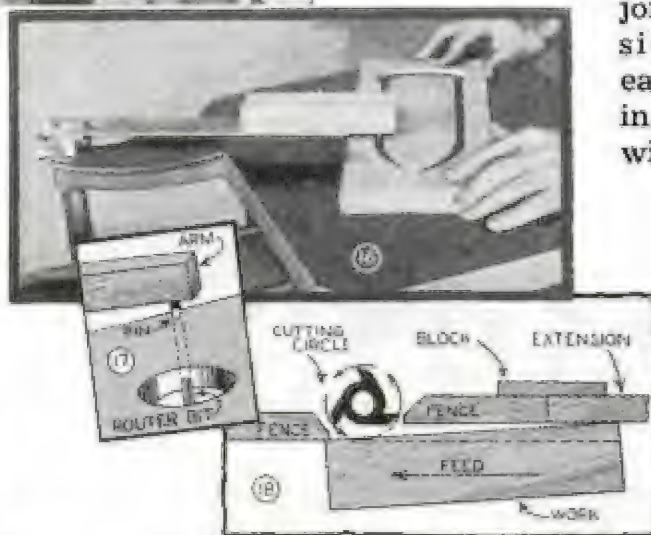


the leg is bradded to the edge of the base. A shaper collar rides on the form, adjustments being made to give the proper depth of cut. The dividing head spaces the cuts accurately.

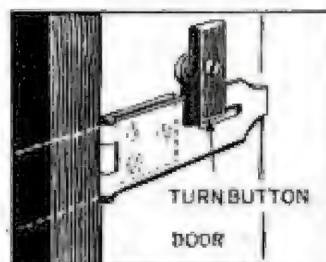
Referring back to the paragraph on outline planing, you will see that the compound cutting of a cabriole leg can be done quite well on the shaper by mounting the leg in the fluting jig and using a suitable pattern. Fig. 13 and the detail at the left show another cabriole leg operation—the rounding of the outer corner. This is done by using hardwood V-collars on either side of the cutter, and feeding the work freehand as in Fig. 13 where the cutter is mounted on the drill press. A standard shaper operation with a simple jig is the molding of circular work, as in Figs. 14 and 15. With this jig, the work need only be roughly sawed to shape, after which it can be mounted at the required position on the jig and swung into the cutter from the fixed pivot point. Another shaper job is routing, as shown in Figs. 16 and 17. The general practice is the same as in the familiar drill-press method of routing, except that the pattern is above the work. This is an advantage in routing intricate

work, making it unnecessary to “feel” for the opening as is required when routing is done on the drill press with the pattern below the work.

One of the most useful standard operations which can be done on the shaper is taper jointing. A straight knife is placed on the spindle, and the rear fence is set even with the cutting circle of the knife. The front fence is then set back the required amount of taper, and, from a starting position, as shown in Figs. 18 and 19, the work is pushed through to make the required taper cut. This method has two advantages over the similar method of cutting tapers on the jointer. The fence extension can be fitted more easily, and cuts up to 1 in. taper can be made with one pass.



Hasp Held Flat by Turnbutton



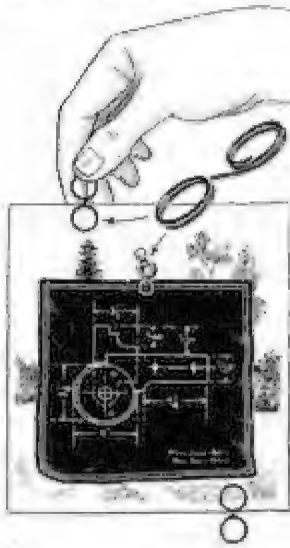
After catching my clothing on a swinging lock hasp on a storeroom door, I installed a wood turnbutton above the hasp as shown, so that it could be folded

back and held out of the way. Washers were used to space the button from the door so it could be turned over the hasp.

—Edward Hartel, Jamaica Plain, Mass.

Clips Keep Blueprints Clean

To avoid soiling blueprints in a shop where they had to be picked up frequently with dirty hands, one foreman made a

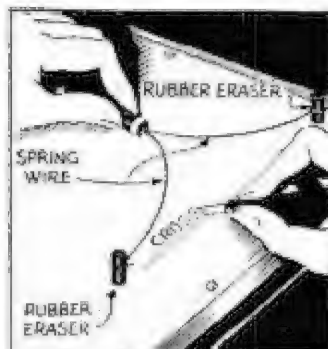


number of simple spring clamps to slip over the corners to serve as finger grips for the workmen. Each clamp was made by cutting a piece from a window-shade roller containing four coils, which were opened between the second and third coil and bent to the shape

shown. The edge of the blueprint then slips easily between the two coils of either end, yet they grip the paper firmly.

Sign Writer Uses Spring Spreader to Hold Cloth Taut

Draftsmen and other artists who do much hand lettering on cloth or paper are often inconvenienced by having the fabric buckle at that point. Although it is customary to spread the fabric smoothly with the finger and thumb of the left hand, while the right hand operates the pen, perspiration marks may remain to leave the drawing messy, if not soiled. To eliminate this trouble, get a length of spring wire and loop the ends around two rubber erasers, which are usually purchased with automatic pencils. Bend the wire in the center so that the double point, or bend, may be inserted into a small hole drilled in the end of any convenient wooden handle. In use, the rubber tips of the device are placed upon the fabric, over the portion upon which the lettering is to be done. Pressure applied will spread the rubber tips and smooth the surface of the cloth.



Building Construction Speeded with Canvas Hoisting Bags

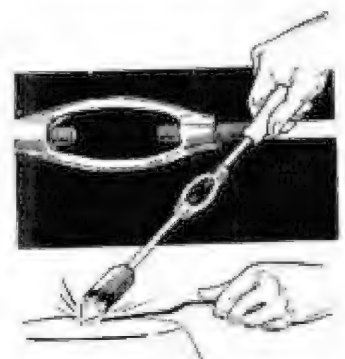


False canvas bottoms on wheelbarrows hold sand to be hoisted without delaying workmen

To eliminate much of the labor and time ordinarily consumed in transporting sand and similar materials to the upper floors of a building in the course of construction or repairs, one contractor uses a number of canvas squares, which are provided with steel rings securely attached to the four corners. In use, the workman spreads one of these squares over the bottom of his wheelbarrow, fills it with sand and wheels it to the hoisting rope. The rings of the canvas are drawn together and slipped over the hoist hook.

Soldering-Iron Handle Kept Cool by Small Turnbuckle

One tinsmith cuts the shaft of his soldering irons, threads the severed ends and screws them firmly into small turnbuckles, such as commonly used for tightening bucksaws. He claims that the turnbuckles prevent the shafts from becoming hot enough to burn the handles of the irons.



Trackwalker's Grease Bucket Supported on Legs

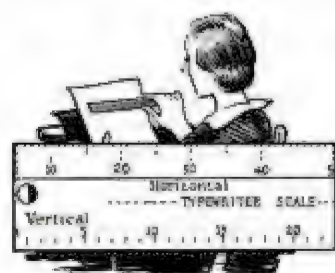


Legs keep trackwalker's grease bucket level when it must be set on inclined roadbed

One trackwalker whose job is to lubricate switches and the rails at cross-overs has his grease bucket fitted with folding legs. These are pointed so that they are easily pushed into the ground to hold the bucket level when it must be set on an incline. Also, the legs hold the bucket at a height within easy reach of the worker. When not in use, the legs are folded up against the side of the bucket where they are held by a wire ring as shown.

Typewriter Ruler Saves Time

Typed on a strip of heavy paper, this simple ruler was found very handy by one stenographer. It is useful in taking true copies of material already typed in which the copies must be the same as the original in headings, margins, spacing of paragraphs, etc.

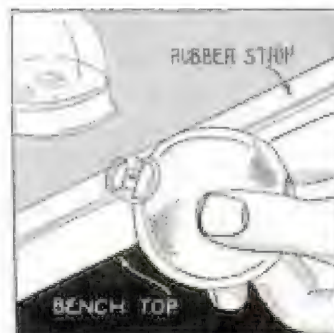


It is a simple matter to center lines, determine margins and the number of spaces indented for paragraphs, as the ruler reads

the same as the scale on the typewriter. The vertical lines give the number of spaces to be turned on the platen. Also, the ruler is handy for filling in blanks on report forms as you can determine how many letters can be placed in each blank and how numbers or other information must be crowded in order to get them in one blank space.—A. Dakon, Weeping Water, Nebr.

Jeweler Winds Watches on Desk

Jewelers and watch repairmen who have several watches to wind daily will find that a strip of rubber cemented to the top of a desk or counter at the edge simplifies the work. To wind a watch, the stem is passed over the rubber with enough pressure to cause it to turn. Very little practice is needed to determine when the watch is wound sufficiently.



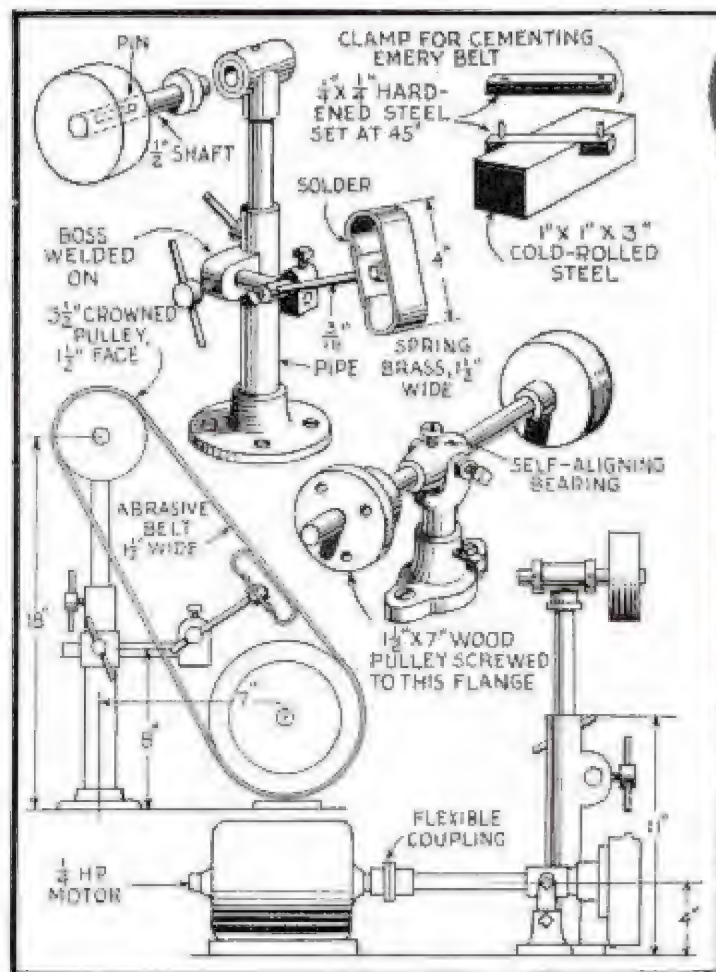
Putty Kept Soft in Winter by Heated Brick

When a number of broken windowpanes are to be replaced in cold weather, and it is inconvenient to bring the sash to the shop, the putty may be kept warm and soft by putting it on a heated brick. This should be wrapped in oilpaper, which will prevent the putty from sticking.



Glazier keeps putty soft on cold days with the aid of a heated brick

This Emery-Belt Polisher Saves Hand Work



It's no trick to get a fine, uniform polish on metal with this machine, which also serves as a light grinder

This belt polisher does many jobs which cannot be handled accurately on a buffer, or by hand, and a spring plate against which the work is pressed, with the belt between, assures an even polishing all over. Emery belts for the polisher are easily made with the aid of the belt-cementing clamp shown. The ends of emery cloth are cut off at a 45° angle, belt cement applied, the ends lapped 1/4 in., and placed in the clamp, which is set in a vise. The pressure thus applied almost "welds" the ends of the belt together, forcing the grit into the fabric. As shown in the drawing, the various parts require little machine work, pulleys being of wood and the standard of pipe. The universal arm, which supports the spring plate, is made of cold-rolled steel with bosses welded on, and set screws located where required. The spring plate itself consists of a strip of spring brass bent as shown and soldered to a steel piece to which the extension arm is bolted. By the use of a self-aligning bearing, purchased for a small sum, and a coupling or universal to the armature

shaft of the motor, the polisher can be driven direct. If a belt drive is desired, two bearings should be used on the driven shaft to keep it in alignment.

Ear Muffs Fastened to Sun Glasses

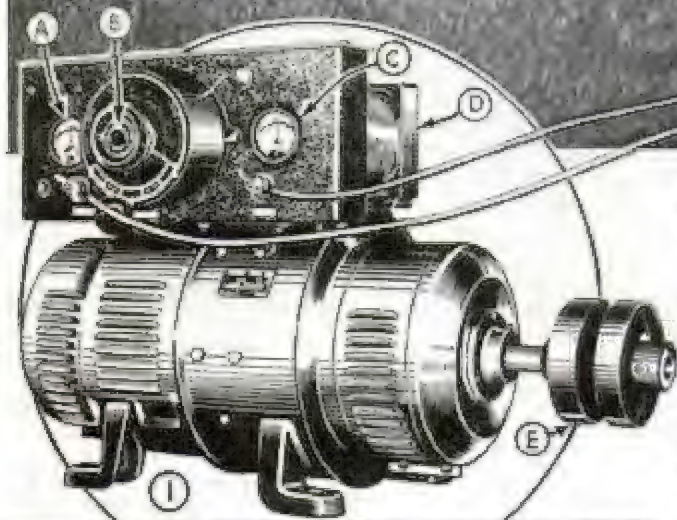
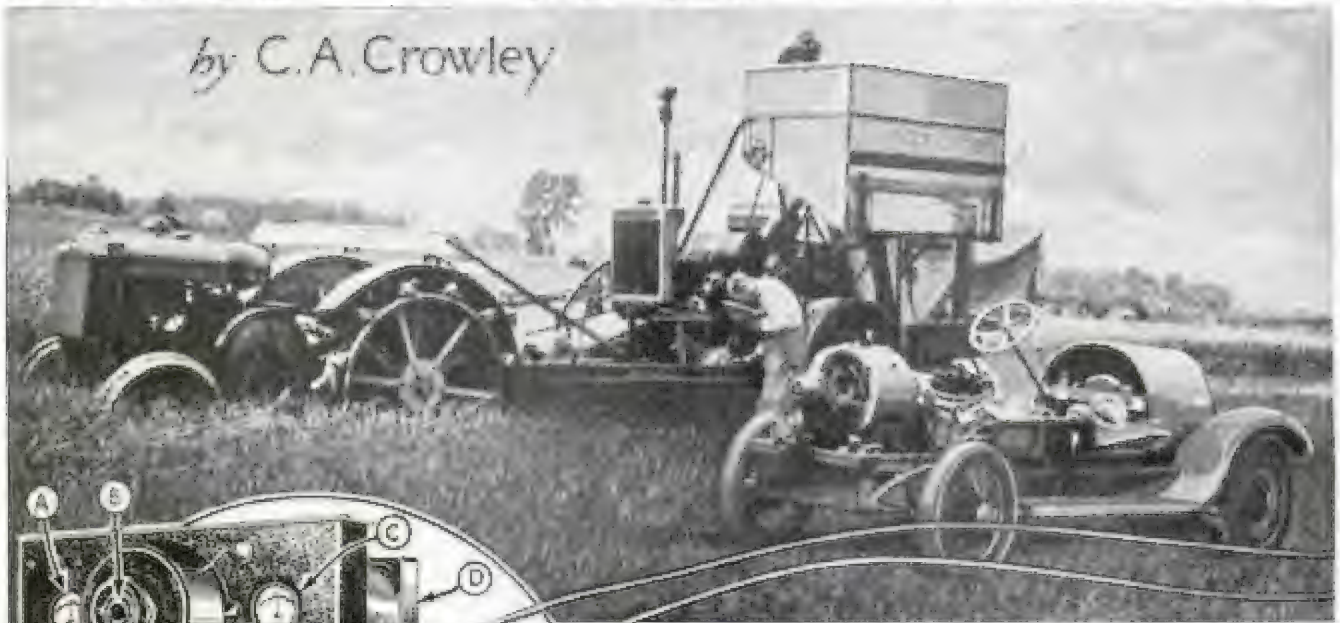


If you attach ear muffs to your sun glasses, you will have a good combination for bright, wintry days. Just make a tiny opening in the cloth covering of each muff to take the temples of the glasses and sew them in. Worn in this manner, the temples are removed from be-

hind the ears so that pressure from the muffs does not cause pain if worn for several hours at a time.

Auto Motor Runs

by C.A. Crowley



TYPICAL ARC-WELDING GENERATOR

(A) AMMETER (B) FIELD RHEOSTAT CONTROL (C) VOLTMETER
(D) ARC CONTROLLING REACTOR (E) COUPLED TO GAS ENGINE

IF YOU are interested in an electric-arc welding business, there is nothing like a portable outfit with the welding generator driven by an old auto motor. You can tow it directly to the job and do the welding in less time than a customer could dismantle his machine and bring the broken part to your shop, thus saving him costly time delays. Outfits of this type will handle almost any job, including the welding of steel, cast iron, stainless steel, manganese steels, aluminum, copper and numerous other alloys in common use. The same equipment may also be used for carbon arc welding and for cutting steel and cast iron. While there are various types of portable outfits, including the type where the motor is used both as motive power and to drive the generator, the simplest and most practical is the trailer type with

the motor coupled directly to the generator, one of which is pictured in Fig. 2.

The generators used in electric-arc welders are of special design and construction to meet the exacting requirements imposed by welding. It is, therefore, not practical to rebuild generators which were originally designed for other purposes. It should also be noted that automobile generators and starters cannot be converted into satisfactory welding machines. There are many welding generators on the market which can be purchased for a nominal sum, one of which is shown in Fig. 1. First, determine the size needed. The table in Fig. 3 gives four standard sizes of welding generators and the horsepower rating of the motors which should be used as a drive. For ordinary repair work, including auto and farm-machinery repairing, a 200-amp. generator will be satisfactory. However, if you feel that a generator of a larger capacity might be needed, then the 300-amp. unit should be selected.

In order to make clear the highly specialized design of welding generators, an exploded view of a popular type is given in Fig. 4, together with a wiring diagram indicating the internal circuit connections for both generator and controlling devices in Fig. 5. You will notice that the generator really consists of two generators. The small one is the exciter, and its purpose is to generate the voltage which is

ARC WELDER

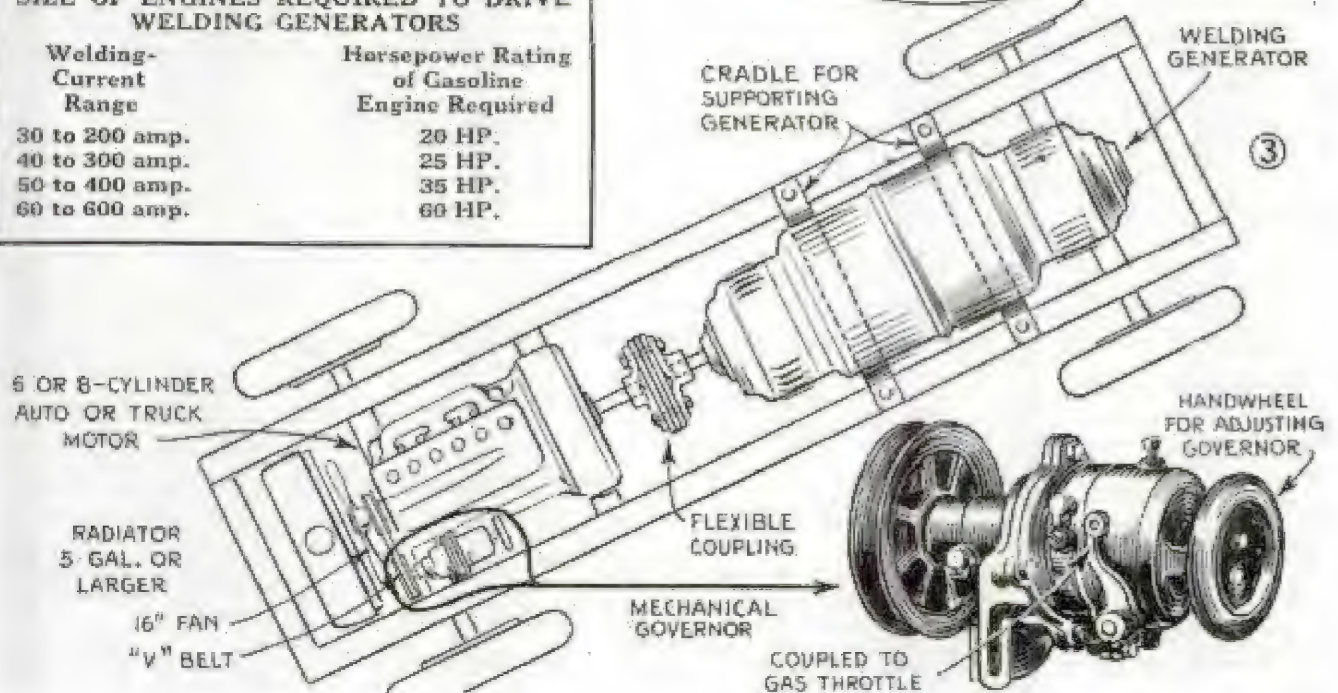


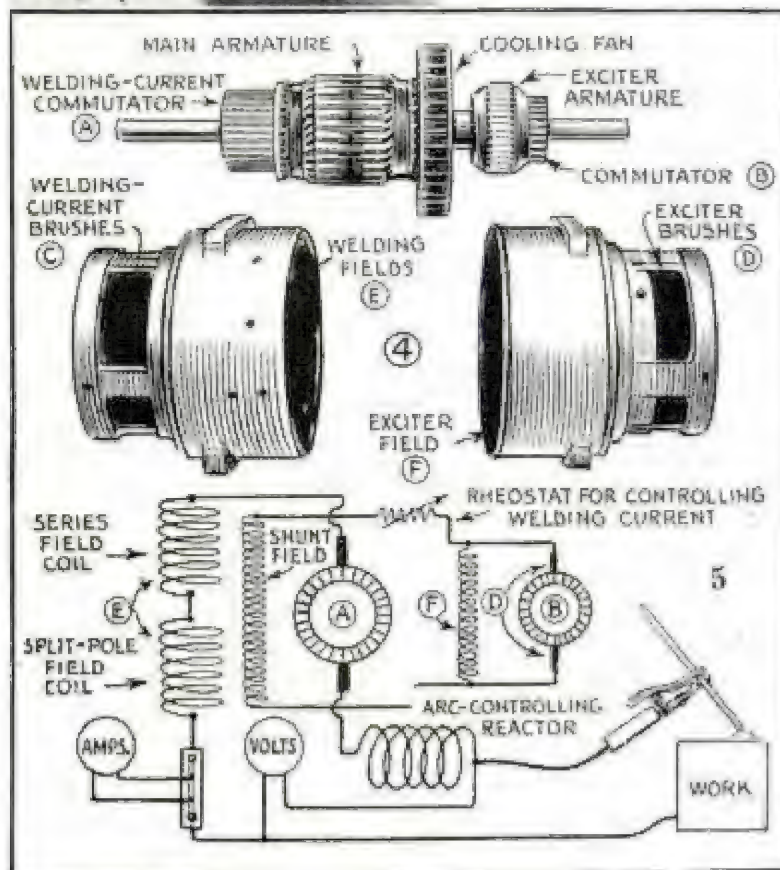
applied to the second or welding-current generator to regulate the output. The welding generator proper is constructed with split-pole field coils in addition to the regular field coils. The field rheostat is used to control the voltage and amperage across the arc.

Having obtained the generator, the trailer is next. Almost any standard chassis will do, and very little alteration is necessary. Two

SIZE OF ENGINES REQUIRED TO DRIVE WELDING GENERATORS

Welding-Current Range	Horsepower Rating of Gasoline Engine Required
30 to 200 amp.	20 HP.
40 to 300 amp.	25 HP.
50 to 400 amp.	35 HP.
60 to 600 amp.	60 HP.





front-wheel assemblies are frequently used and heavy steel cross members are riveted across the frame for mounting the generator. These must be strong enough to eliminate vibration as much as possible. Mountings for both a belt drive and a direct drive are given in Figs. 7 and 8. Figs. 3 and 6 show the hook-ups and Fig. 9 shows a completed job. Note that the transmission has been removed from the motor, thus exposing the end of the drive shaft extending from the flywheel. On this end of the shaft a flexible coupling is in-

stalled, the motor side of the coupling being bored out to a diameter to fit the shaft. Couplings of this type may be obtained already bored out so that one half of the unit will fit the shaft of the generator and the other half cast in blank for drilling to suit. If you have access to a lathe, it is a simple matter to center up the motor half of the coupling and drill it to a size corresponding with that of the flywheel shaft. If it is inconvenient to couple the generator directly to the shaft of the motor with a flexible coupling, it can be driven with a belt from the motor shaft. In this case, the generator is supported on top of the chassis frame and both the flywheel shaft and the generator are equipped with 6-in. pulleys of the standard steel-core type. These pulleys and a belt of corresponding width will transmit sufficient power to handle a 200 or 300-amp. generator.

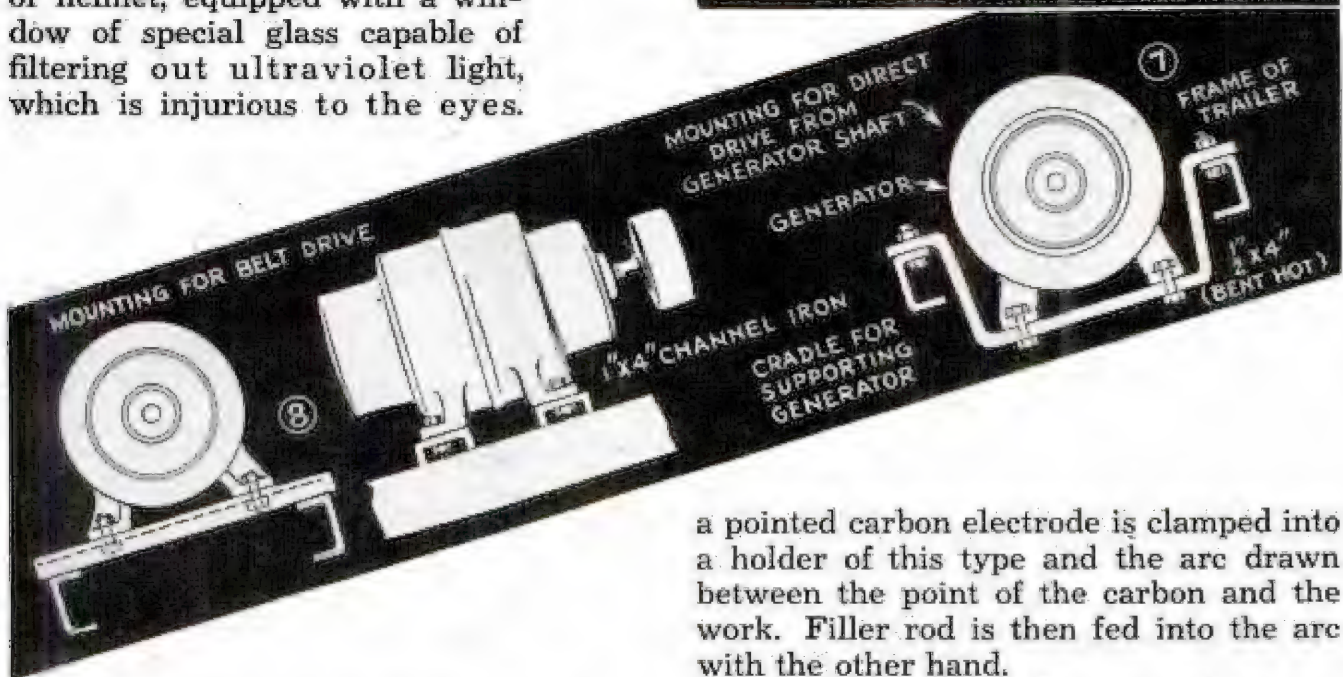
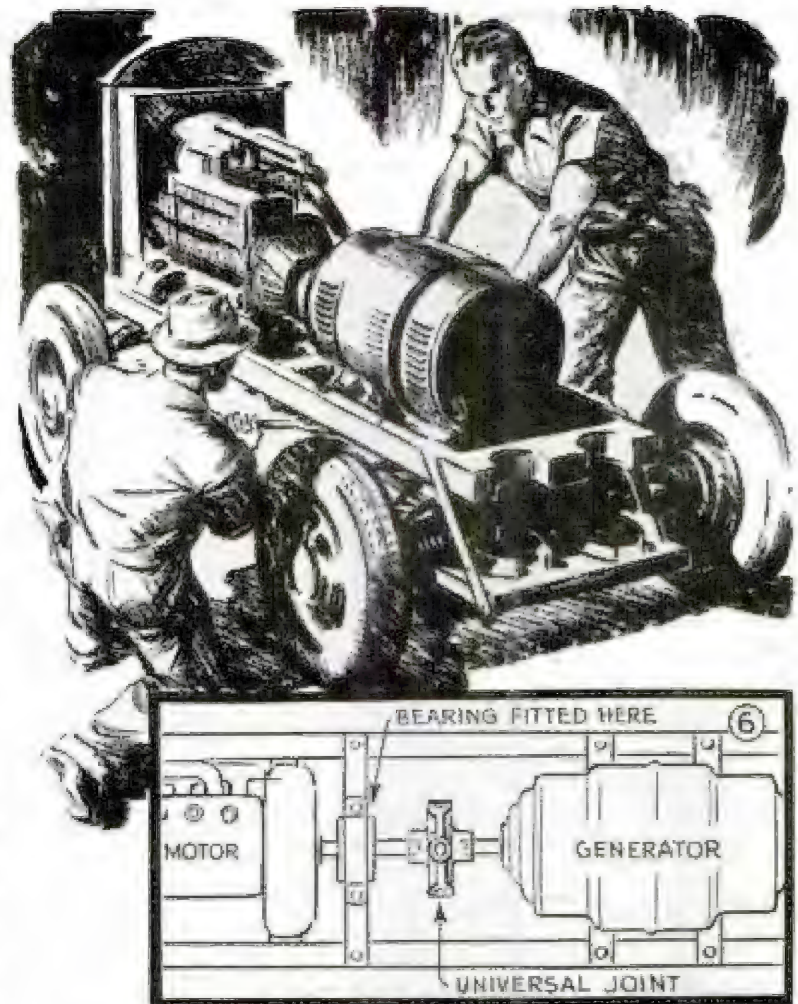
Selection of a motor to drive the generator requires a little more care, however, as the success of your venture depends largely on it. Any 6 or 8-cylinder motor of the popular cars will deliver enough power to operate a 200 or 300-amp. generator. Lack of smoothness in the running of 4-cylinder motors makes them less satisfactory for the purpose. Having obtained the motor, it should be overhauled and put in good condition to operate at maximum efficiency. Only a few changes are needed for the motor. The radiator should be replaced with one having a capacity of at least 5 gal., as stationary operation of the motor may cause it to overheat if a smaller radiator is

used. Secondhand truck radiators in good condition, will serve nicely for the purpose. Also, it is advisable to equip the motor with a fan at least 16 in. in diameter. To hold the motor at a steady speed, a governor will be needed. This, of course, can be homemade, but it is usually best to purchase a variable-speed governor as shown in Fig. 3. For ordinary jobs, the governor is set so that the generator will be driven at 1,500 r.p.m.

After the generator and motor have been assembled on the trailer chassis, and

standard-type welding cables, an electrode holder and a ground clamp have been installed, the unit is ready for service. Figs. 10 and 11 show the final connections. In addition, a frame should be constructed over the entire assembly so that a removable canvas or other covering may be placed over the unit to protect it against rain as in Fig. 9. In no case should the welding generator be allowed to become damp as this would short circuit the windings and render it unfit for further service until dried out. Welders should never be operated with the motor and generator covered as a considerable amount of heat is generated in both.

When the unit has been assembled completely, the owner should give close attention to the practice of welding in order to gain the skill required of an efficient welder. The accessory equipment should include a welding shield or helmet, equipped with a window of special glass capable of filtering out ultraviolet light, which is injurious to the eyes.

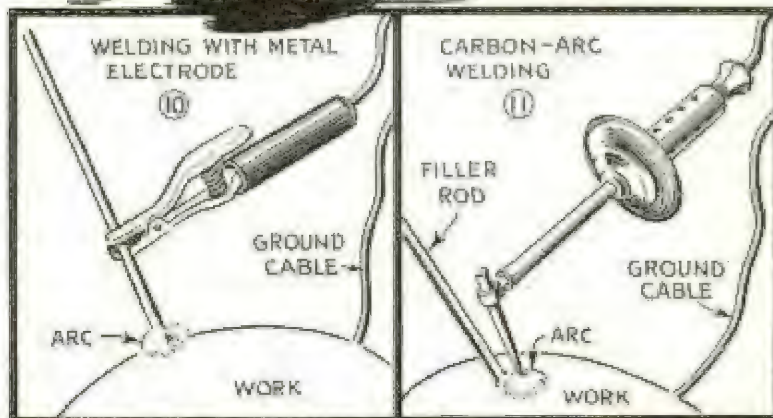
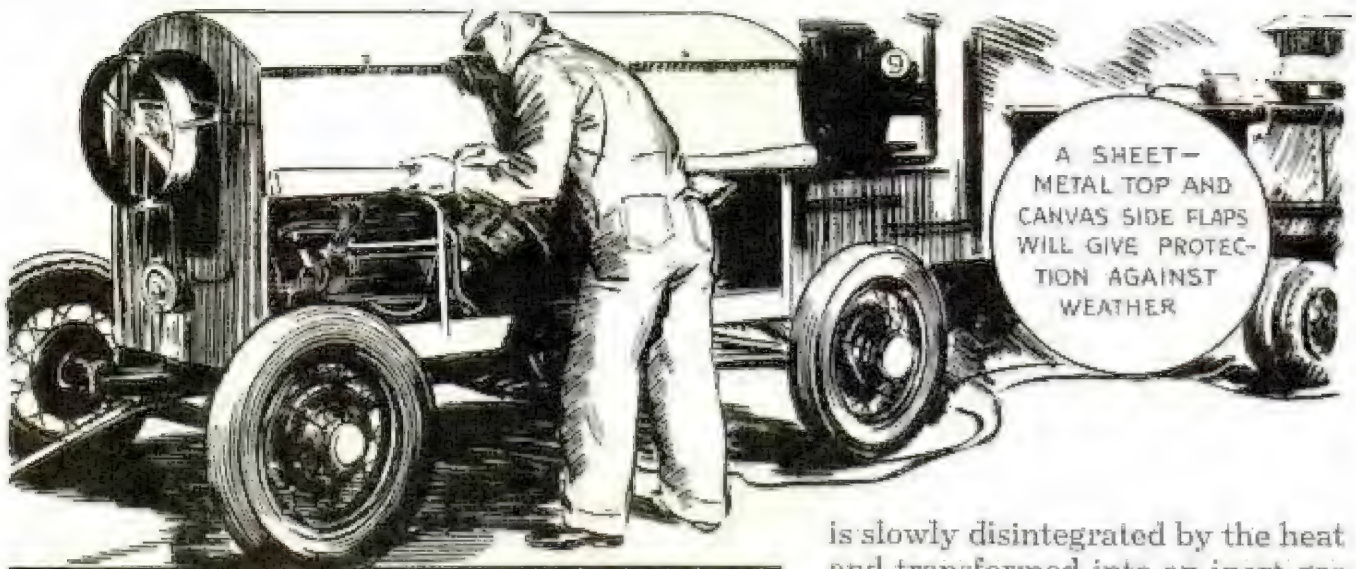


Gloves, jackets and other clothing which will prevent sparks from getting into contact with the body and causing burns should also be provided.

An electrode holder of the type shown in Fig. 10 is used for all-around work with metal electrodes. For carbon-electrode work, a holder of the type shown in Fig. 11 will be needed. In carbon-arc welding,

a pointed carbon electrode is clamped into a holder of this type and the arc drawn between the point of the carbon and the work. Filler rod is then fed into the arc with the other hand.

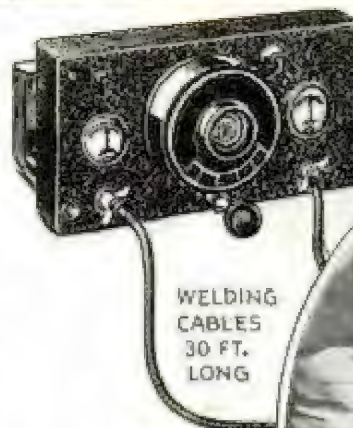
Special welding cables are used to connect the various types of electrode holders and ground clamps to the welding machine. These cables should be of the type made particularly for electric arc welding and should be large enough to carry the maximum current developed by the machine. The cable leading from the generator to the electrode holder should be 30 ft. long and should be equipped with a heavy



lug for connection to the generator as well as with a standard type of ground clamp. A stiff brush for removing scale and corrosion before welding, Fig. 12, should be a part of the standard equipment.

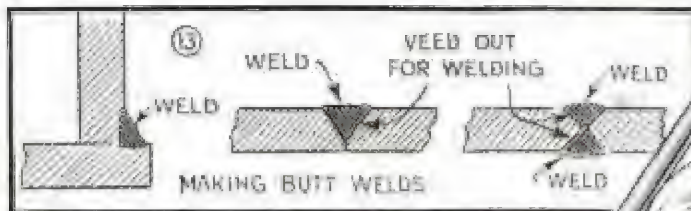
To make a weld, the ground clamp is securely fastened to the work, the generator started, and the electrode brought into contact with the metal surface to be welded. The electrode is immediately withdrawn a distance approximately equal to the diameter of the welding rod being used. This causes an arc, and metal from the electrode will be deposited on the work if the electrode is connected to the negative side of the generator. For ordinary work with metallic electrodes, this connection is used. It should be noted that electric current causes the transfer of metal from the electrode to the work. Therefore, electric welding may be effected overhead. Fig. 14 shows a diagram of what takes place when the electrode is being used. The coating

is slowly disintegrated by the heat and transformed into an inert gas which completely surrounds the hot arc, thus preventing the metal from being oxidized, which makes possible the production of a strong weld. It should be noted that the metal from the electrode is transferred to the surface being welded more rapidly than the heavy coating is destroyed. It is by this means that the arc may be directed accurately so that its maximum intensity is available at the spot where the metal is to be applied.

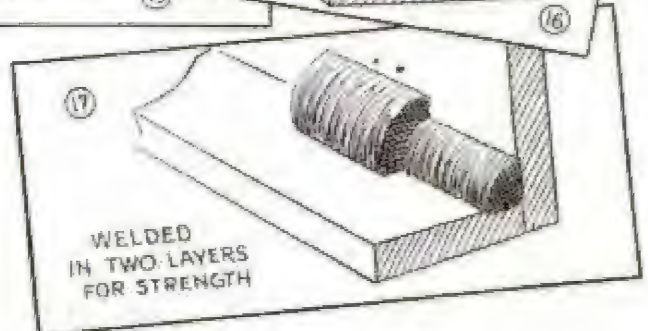
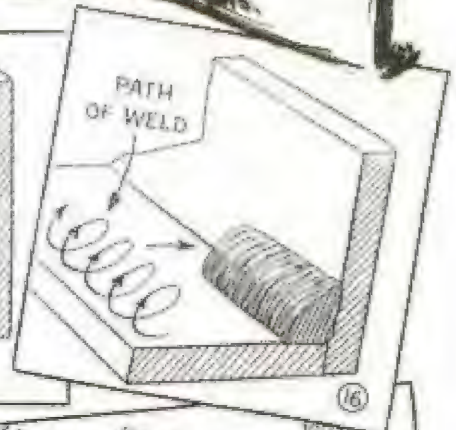
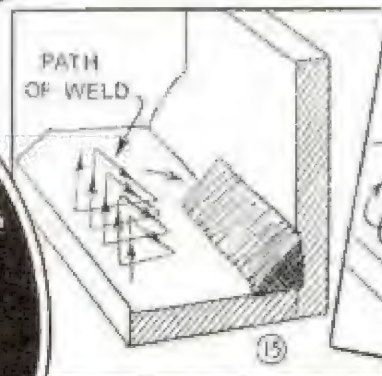
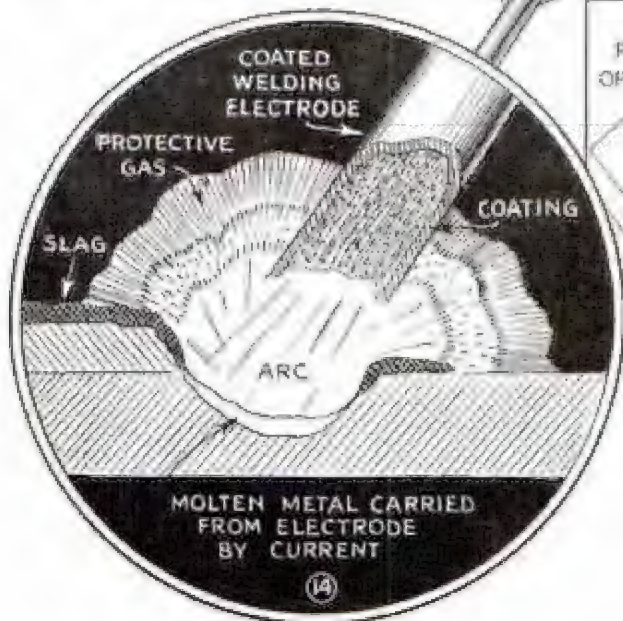


Special types of electrodes are available for welding copper, aluminum, stainless steel, manganese steel and cast iron. In addition, there are also available general-purpose electrodes which may be used for welding the grades of steel encountered.

To use the electric-arc equipment for



To correctly prepare the work for butt welds adjoining surfaces should be "veed" out so that the molten flux will run between them



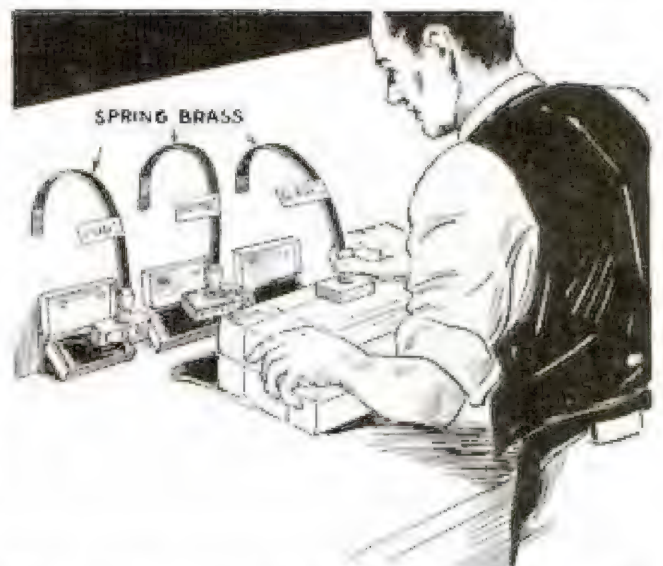
certain classes of welding where it is desirable to feed special filler rod into the weld, the carbon electrode should be used. The carbon electrode is used in the same manner as the metal electrode, except that

brazing rods and rods of other alloys are fed into the hot arc formed between the carbon and the work. Figs. 13, 15, 16 and 17 show methods which have been found satisfactory for making butt welds.

Rubber Stamps on Springs Save Time for Shipping Clerk

To speed up the work of stamping packages in his office, one shipping clerk suspended the rubber stamps from the wall above his desk with lengths of spring brass. The springs keep the stamps raised out of the way when not in use, yet permit them to be brought down against the ink pads and onto the packages with one swing of the hand. The pads, which are screwed to the wall by the lids, are set at an angle corresponding to that of the stamps when the latter contact them. Thin wood blocks attached to the springs show the lettering of their respective stamps.

Expand a spool of wire by heating it before winding a coil and you'll have a snug job when the windings contract.



These spring-mounted stamps save lost arm motion in busy shipping clerk's office

Removable Step on Rear Bumper to Get Luggage from Trunk

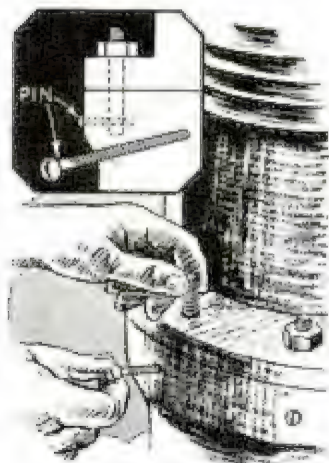


Block slotted to fit on bumper makes handy step when lifting luggage from trunk

To simplify removing luggage from the trunk, one car owner carries a hardwood block notched to fit over the upper edge of the rear bumper. It makes a dandy step to stand on when lifting out the luggage, and takes little room in the trunk or tool compartment when not in use.

Repair for Stripped Threads in Aluminum Crankcase

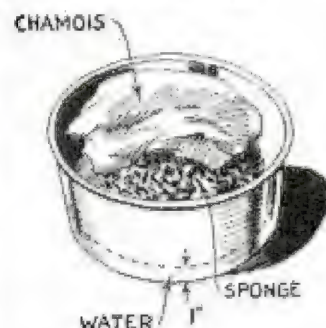
If you have the misfortune to strip the threads from a bolt hole in an aluminum crankcase, a repair can be made by pinning the lower end of the stud in the hole. To do this, substitute a headless bolt or a stud threaded at both ends for the regular stud or cap screw, and drive it firmly in place. Then drill through both the crankcase and stud, and insert a long, slender machine screw. Use a screw large enough



to cut shallow threads in the aluminum as it is driven into the hole. The projecting end of the stud or bolt can be fitted with a nut.—Paul Sikson, Cicero, Ill.

Keeping the Chamois Skin Damp for Cleaning Windshields

One filling-station operator who had difficulty in keeping his chamois skin damp enough to clean windshields, yet not too wet, solved the problem in the following manner:

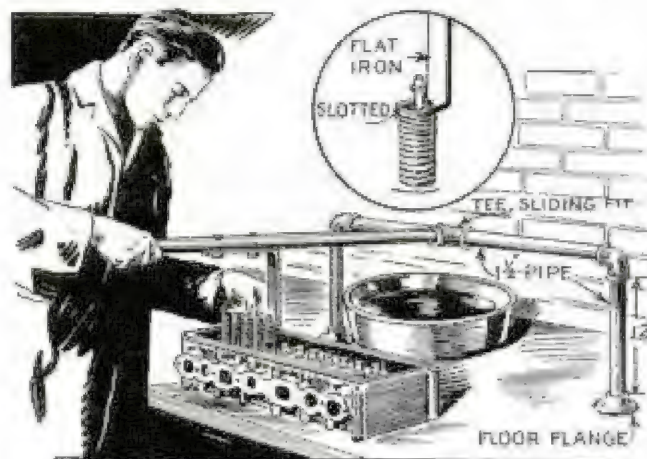


He put a large sponge in a shallow container with about 1 in. of water in the bottom, and placed the chamois on top so that it would absorb just enough water from the sponge to keep it moist and always ready for instant use.

—Paul A. Ruddell, Fort Scott, Kan.

Valve-Removing Tool on Bench Speeds Up Grinding Jobs

Mounted on a workbench as shown, this tool of pipe and fittings simplifies the job of removing springs from valve-in-head



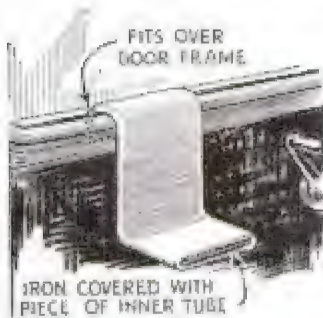
Springs are rapidly removed from valve-in-head motors with this simple depressing tool

motors. The handle or pressure arm, which is pushed progressively along the pipe support as the valves are removed, carries a depressing lever of flat iron notched at the lower end to straddle the valve stem. When working on a motor head having recessed valves, a board with a number of

equally spaced wood blocks screwed to it, is slipped under the head to support the valves while depressing the springs.

—Jos. C. Coyle, Tucson, Ariz.

Driver's Detachable Armrest Hooks over Door Frame

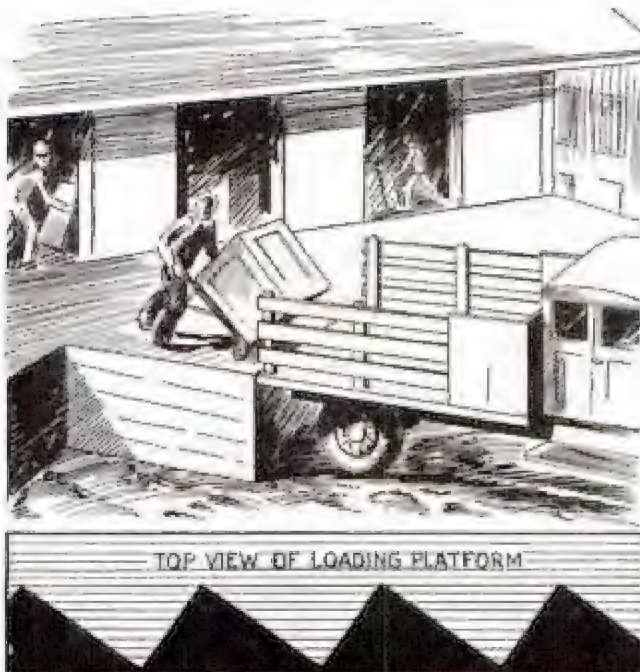


Bent from a piece of heavy sheet iron or steel, this armrest can be moved in a horizontal plane to meet the requirements of different drivers, and when not needed,

it can be lifted off the door and stored under the seat. A section of inner tube is slipped over the rest to serve as a cushion.

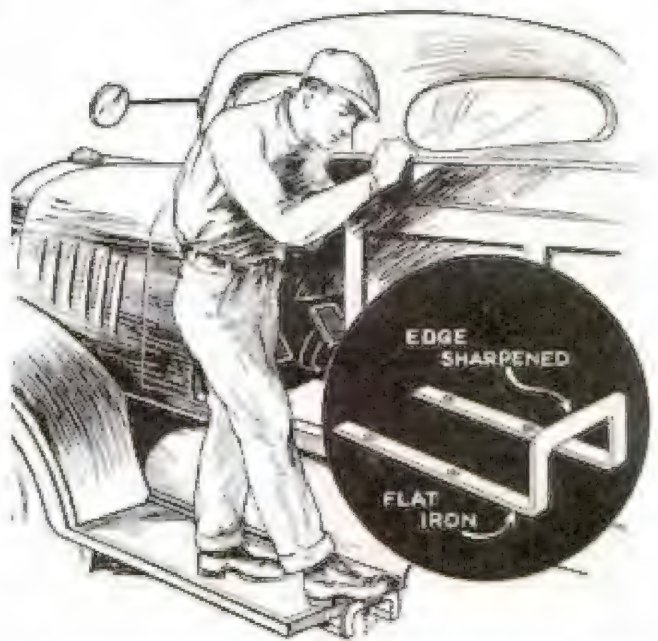
"Saw Tooth" Loading Platform Aids Truck Drivers

Built with the front side resembling a huge saw, this loading platform enables trucks to be backed in at an angle, thus saving time in "spotting" them. Also, it permits plenty of room for other trucks to pass when the loading platform is in a narrow alley, and accommodates more trucks at one time for a platform of given length than when the front is straight.



The staggered front of this loading platform accommodates more trucks than one with a straight front

Shoe Scraper on Running Board Keeps Cab Clean



Conveniently located on the stub running board, this shoe scraper is always at hand

Truck drivers who dislike to enter their cabs with muddy shoes will find that this scraper, which is screwed to the end of the stub running board, solves the problem. It is out of the way yet always at hand when needed.

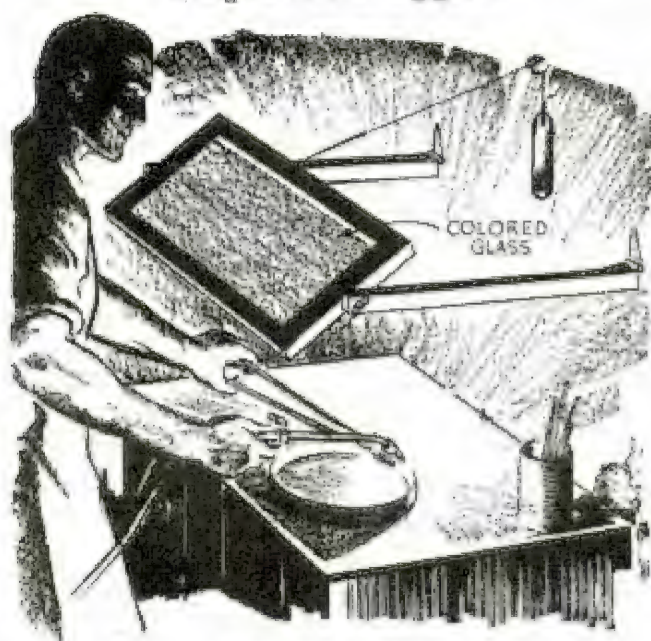
Snow "Shorts" Spark Plugs

One owner of a popular eight-cylinder car who experienced considerable trouble with the motor missing badly during a snowstorm, found that the snow blowing in through the hood louvers short-circuited the spark-plug wires. To avoid this, he bent the wires so that they would be as far as possible from the inner edge of the cylinder head and then wrapped them with tape as shown.



The same trouble can also be caused by rain blowing through the hood louvers. Also, after a car has been standing in a snowstorm, lift up the hood and remove any deposit of snow from the spark plugs.

Welder's Eye Shield on Wall Replaces Goggles



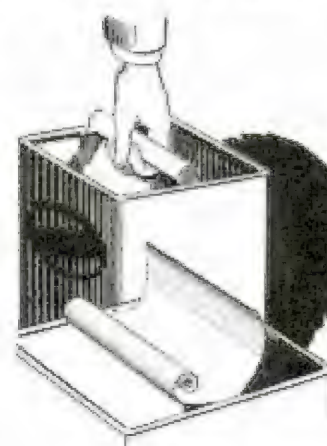
This welder's eye shield is always at hand, and is brought into use by merely pulling it over the work

Because some of his mechanics neglected to wear colored goggles when doing a welding job, one shop foreman took a framed pane of colored glass, pivoted it

between two arms and hinged them to the wall so that the shield could be held between the workman's face and the work as shown. A rope and small counterweight permitted the shield to be adjusted at various heights.

Buckets Made from Oil Cans

Buckets that are handy for carrying water and various materials are easily made from discarded 5-gal. oil cans. To provide a handle, take a pair of tinners' shears and cut out the top, leaving a strip of the metal about 1 or 1½ in. wide uncut at the center. Then roll the metal from opposite sides toward the center. This will provide a handle which is strong and easy to grip.



—A. H. Waychoff, Tempe, Ariz.

The Next Issue

FROM COAL BINS TO RECREATION ROOMS

How wasted basement space can be converted into recreation rooms for parties and games by utilizing materials available in any locality. Specific information on damp-proofing concrete walls and floors, framing partitions, covering ceilings, enables the home handy man to do a first-class job.

HIGH TEMPERATURES READ BY ELECTRIC INDICATOR

Reading temperatures of molten metal, hot bearings, etc., up to 2,500° F. by means of homemade thermocouples which are easily built and calibrated.

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COMBINATION COLD FRAME AND HOTBED

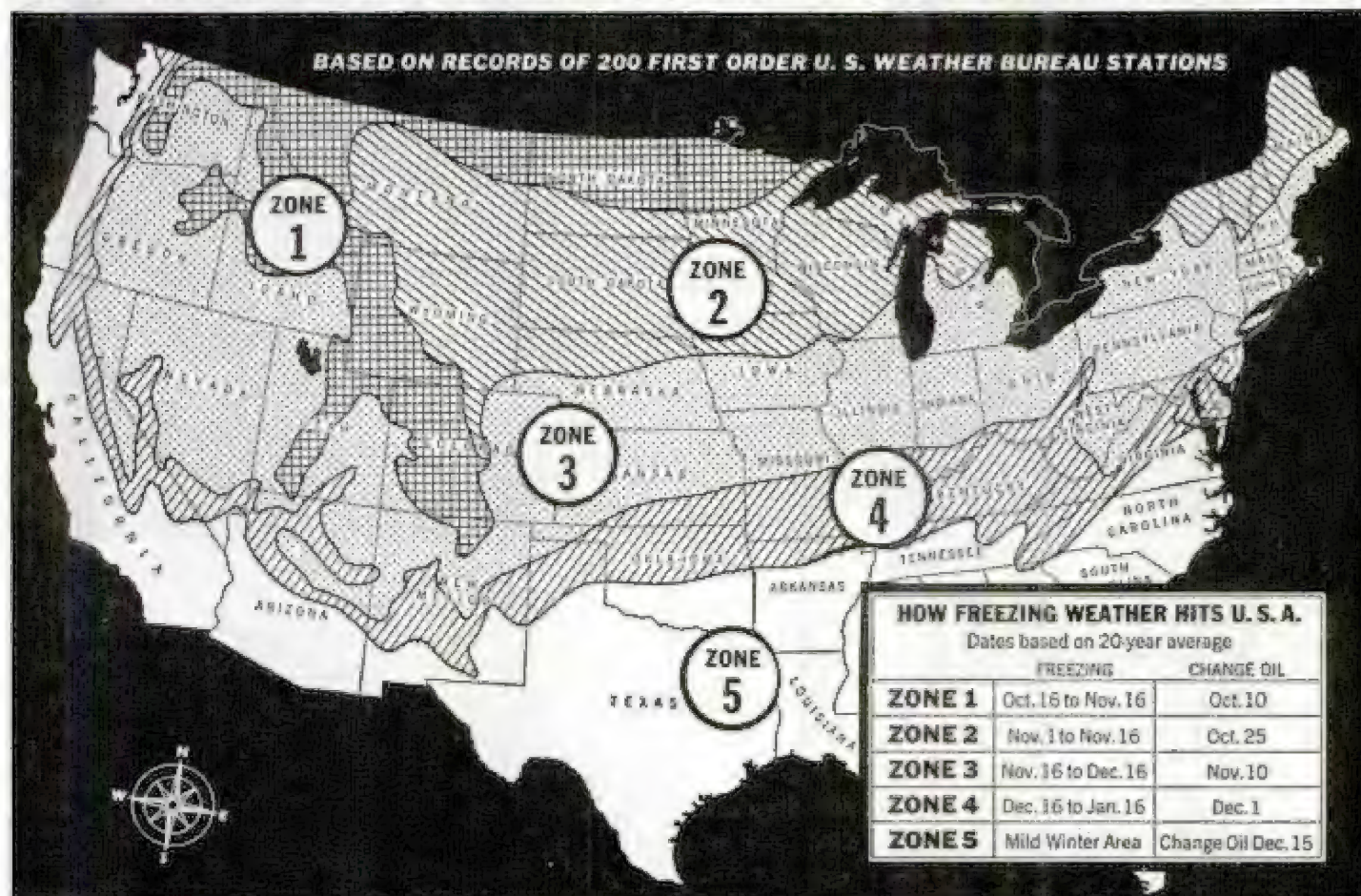
Can be used either as a cold frame or an electrically heated hotbed. The frame stands 30 in. above ground and will accommodate about 700 seedlings.

"TRIP 'EM" GAME FOR THE HOME

Simplified pin-ball game, played by two, or four as partners. Has magnetic trips in certain holes which must operate to get a high score.

FINAL WARNING TO MOTORISTS!

MAP SHOWS WINTER OIL-CHANGE PAST DUE IN 40 STATES



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Millions know that Mobiloil dealers do this job best! Through two of the hardest winters on record, these motorists have proved that Mobiloil Arctic makes starting quicker and easier — protects engines better — gives longer mileage. They've

learned that Mobiloil Winter Gear Oil makes shifting safe and easy.

Stop today at the familiar Mobiloil sign, or the Sign of the Flying Red Horse. Protect your engine with Mobiloil Arctic or (for *extreme* cold conditions) Mobiloil Arctic Special. And protect your gears 100% with Mobiloil Winter Gear Oil.

SOCONY-VACUUM OIL COMPANY, INC.

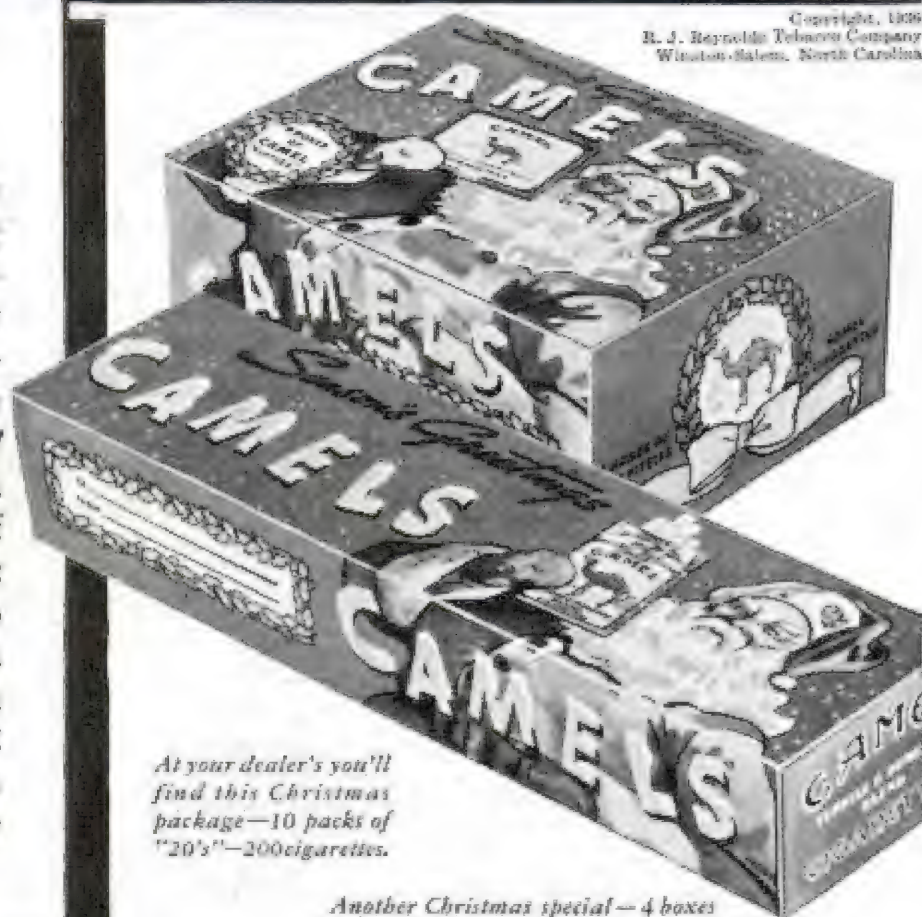
CHANGE TODAY Mobiloil Arctic

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Another Christmas special—4 boxes of Camels in "flat fifties"—wrapped in gay holiday dress. (Right, above)

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(Right) A full pound of Prince Albert, in a real glass humidor that keeps the tobacco in perfect condition and becomes a welcome possession.



(Left) One full pound of mild, mellow Prince Albert—the "biteless" tobacco—packed in the cheerful red tin and placed in an attractive Christmas gift package.



Gold Farmers of the West

F1208

(Continued from page 93)

by the rivers and dropped offshore where the river currents were slowed down. From these points ocean currents scattered the gold particles up and down the beaches. This material makes up the black sand, which, being heavier than ordinary sand, is not washed up by normal tides. It rests on the bottom of the ocean offshore until wave action during very stormy weather sweeps it up.

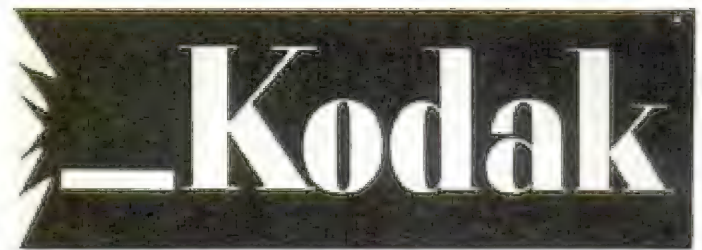
The black sands run from a few cents to as much as five or six dollars per cubic yard in gold. The yellow metal sometimes forms the smallest part of the crop. One sample of concentrate recovered from a sluice box assayed at the rate of \$76,000 per ton and was found to contain about fifty per cent of the value in iridium, thirty per cent in platinum, and twenty per cent in gold. Both iridium and platinum bring higher prices than gold. By working hard a man can usually count on making \$10 a day or more when the black sand is available. Then he must wait until a new storm throws up another deposit.

Thousands of dollars worth of gold and other minerals have been mined from the beaches of Klamath, Gold Beach, Crescent City, and other points, but not enough black sand can be counted on to warrant working it on a large scale. A number of companies have tried to work the beaches with drag lines and large gold-recovery plants but nearly all these ventures have failed.

It has been suggested that tremendous quantities of the rich black material must lie in natural riffles on the ocean floor right off the beaches but so far no one has ever explored the ocean bottom or attempted to suck the material up on barges. One theory is that the immensely rich Rand deposit in South Africa was at one time an ocean placer deposit that was subsequently raised above sea level, and a similar concentration of placer gold might exist off the west coast.

It is estimated that billions of dollars worth of gold are still untouched in the ground in California. Much is so scattered that ordinary mining methods are too expensive and not until after it has slowly been collected by the streams can it be

(Continued to page 150A)



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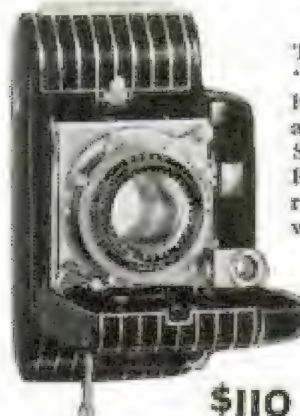


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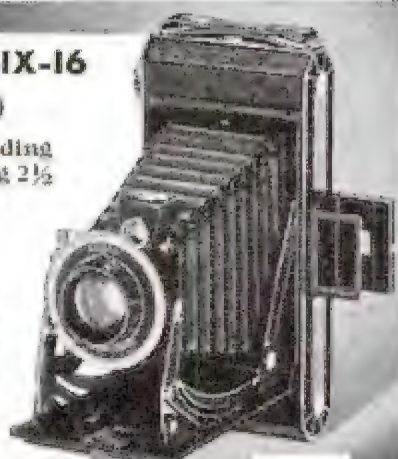
Christmas Guide

FOR THOSE WHO LIKE THEM LARGER

★ *Precision Kodaks*

KODAK SIX-16 (f.4.5)

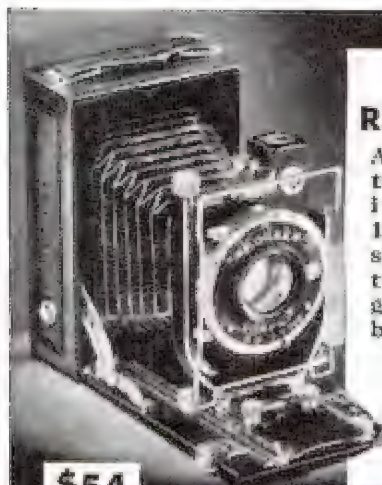
Smallest folding camera taking $2\frac{1}{2}$ x $4\frac{1}{4}$ -inch pictures. f.4.5 lens; 1/400 Compur-Rapid shutter. Price, \$40. (With f.6.3 lens, \$20; with Doublet lens, \$16.)



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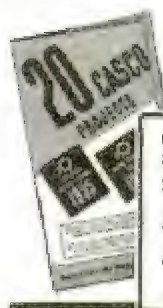
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Motoring on Skis

(Continued from page 87)

chometer, oil, water and gasoline gauges and compass. An air speed indicator attached to the front of the "backbone" causes a dial in the cockpit to show how fast the craft is traveling.

The sled is steered by the front runner. Stability at all speeds is insured by the rudderlike tail which finishes off the sleek-appearing body. Constructed to produce high speed, the entire job looks the part and it is the pride of a small group of winter sports enthusiasts who have formed a club with quarters on the lake shore.

This "super-sled" is the flagship of a fleet of motorized and sail-propelled craft designed for winter use. There are five two-seater power sleds, similar to the high-speed job but driven by less powerful motors. Their speed, with only the driver, is around ninety on smooth surfaces. With two persons in the cockpit, a speed of sixty produces plenty of thrills. Commercially assembled, these sleds may be fitted with outboard or motorcycle engines.

But the clown of the motor fleet is the "bronco," which consists of a small motor mounted in a bicycle frame and geared to an endless track in place of the rear wheel, with a ski in front. The beginner finds the "bronco" considerably harder to ride than appears at first glance and plenty of spills are sure to accompany his first attempt to master it.

For the 1936-1937 season, the club members also have a sailing fleet of fifteen ice yachts which develop high speed with a favorable wind. Most of these boats are of the popular "E" class. The chief difficulty with this type of sports craft is that a six-inch snow prevents travel, whereas the power sled operates over ice or snow.

As a matter of fact, there are many weeks of the winter in the northern United States and Canada when a power sled is the only practical means of transportation. Doctors, postmen, telephone service crews and many others are using this type of craft in their business when heavy snowfall halts railroads, grounds airplanes and blocks highways. Particularly is the low-speed two-seat sled useful for travel under such conditions.

The builders of the super-sled began

work last fall on a "snow sedan" powered with a fifty-horsepower automobile engine, to serve the same purpose, as well as to prevent families in rural districts from becoming snowbound. The first model has a pusher propeller at the back, connected to the engine which also is located at the rear. It has seats for four persons and is enclosed like an automobile. Weighing only 300 pounds without the motor, it is capable of traveling over loose, deep snow at fifty miles per hour. The body, constructed of wood and canvas to keep down the weight, is streamlined and mounted on three wide runners, like the racing sleds. It has front steering. The radiator which cools the engine also acts as a heater for the passenger compartment. The propeller is mounted on a countershaft above the motor, permitting installation of the motor in a low-set compartment where it is protected from the weather.

Assembly of snow sedans by the purchaser is planned by the designers. Suitable automobile engines can be obtained at secondhand dealers and put into good condition with a little work. Instructions for installing the engine and propeller will be supplied with parts for the body.

Racing drivers and racing cars have been the means of bringing the automobile to its present state of perfection. The winter sports club and the super-sled may be the means of introducing an entirely new type of vehicle which will solve the problem of transportation for any area subject to heavy snow.

An Improvised Glue Pot



The home mechanic who does not have a pot for melting glue can improvise an efficient one from a can, a length of wire and a stewing pan. Just get a can of the required size, insert the wire through holes drilled from opposite sides near the top and set the can in a stewing pan as shown. The pan is filled with water and should be of sufficient depth to keep the can from touching the bottom.

—A. H. Waychoff, Tempe, Ariz.



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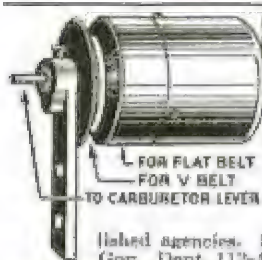
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Men who know their wood-working ... experienced craftsmen ... have discovered that mixing glue in messy old-fashioned glue pots is a waste of time. The modern way, the *sensible* way is to buy LePage's Liquid "all purpose" Glue in handy cans. LePage's guarantees lasting strength. LePage's joints practically "weld" the wood. Ideal for veneering and inlaying. Makes snug joints, reinforces nails and screws, fills small cracks and nail holes. Use LePage's—and the job is permanent. All hardware and drug stores sell LePage's Liquid Glue in the tube, bottle or can. There is no need for any homecraftsman to be without it. LePage's Adhesives, Laboratories and Factory, Gloucester, Massachusetts.



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To control speed of any make of auto or truck engine, regardless of load changes, when used as a stationary or portable power plant. Fully guaranteed. No cash down. Governor speed range from 400 to 3000 R.P.M. Fine opportunity for established agencies. Send for free circulars. Mira, Candee-Smith

Gov., Dept. 112-A 215 No. L. A. St., Los Angeles, California.

New Adding Machine Fits Vest Pocket!...

Adds, subtracts, divides, multiplies like \$200 machines. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, lightning fast. Sells on sight in offices, stores, homes, all who use figures. Write quick for **FREE AGENTS** sample offer and Money-Making Plan.

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BUY at FACTORY PRICES

FREE HOME TRIAL
Money-Back Guarantee
NEW 1937 CATALOG FREE!
Twenty beautiful models for farms and homes. 4 to 11 tubes. Save 50%. One year guarantee on every set. Agents: Send 10c for plan, give away radios FREE—make \$100 a week.

WORLD-WIDE RADIO CO.
2869 Elston, Dept. A, Chicago

as low as
6.95
down

17.95

EUROPE Guaranteed
"Electric-Eye" Radio
7 Tubes—3 Bands. Powerful speaker. Send \$3 deposit. Pay bal. C.O.D.

Docking the Big Fellows

(Continued from page 84)

by the tide, exclude the return of the water at high tide. A ship thus "docked" on a gridiron could be worked on whether the tide was low or high, provided pumps capable of ejecting such water as might leak through the dikes were available. The vessel was undocked by cutting the dike at low tide, allowing it to fill as the tide rose, and floating the vessel out at high tide.

This gridiron inclosed in a dike was in fact a crude tidal dock. Substituting a masonry lined basin for the gridiron and dike, and fitting it with some form of watertight gate and with drainage pumps of sufficient capacity to handle leakage gave us the tidal dock as it existed before the development of the large capacity pumps which made possible the graving dock as it is known today.

The graving dock is a basin into which a vessel can be floated through an opening capable of being closed with a gate, and furnished with large pumps to remove the water. We have such a dock at the Brooklyn Navy Yard, which was finished in 1841 and which is still in excellent condition. The original gates of this dock which were of the canal lock type have been replaced with a boat-type caisson and the old steam pumping engine and drainage pump have given way to motor-driven centrifugal pumps, but otherwise the dock is much as it was when built, nearly a century ago.

The other method of docking large vessels is to lift them bodily out of the water with a floating dock. The floating dry dock is a development of an English sea captain whose ship was damaged in the harbor of Cronstadt over 200 years ago. There being no dock available, the captain purchased an old hull considerably larger than his damaged ship, removed the spars and decks, cut a large opening in the stern and fitted it with a watertight gate. He then flooded the hulk, floated his ship into it through the opening, closed the watertight gate behind her and pumped out the hulk so it floated with the damaged ship inside it. After repairs were completed, the hulk was flooded, the stern gate opened, and the ship floated. This type of

(Continued to page 122A)

WITTE DIESEL ENGINES



1 KILOWATT

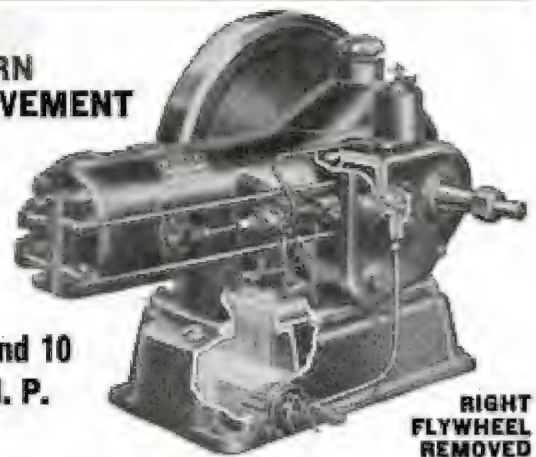
POWER AND LIGHT FOR ONE CENT PER KILOWATT

1
CENT

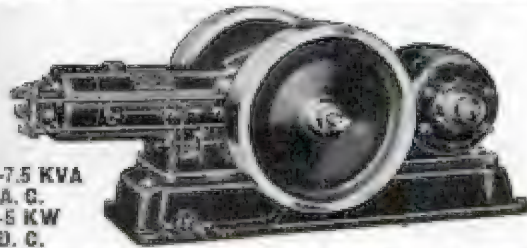
1 HOUR

EVERY
MODERN
IMPROVEMENT

5 and 10
H. P.



RIGHT
FLYWHEEL
REMOVED

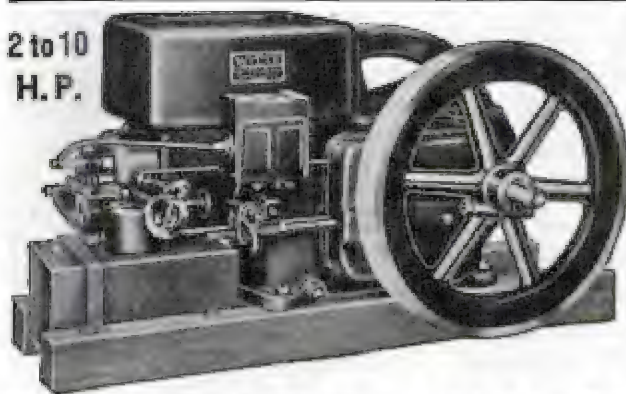


3.5-7.5 KVA
A. C.
3-5 KW
D. C.

DIESELECTRIC PLANTS

Good news for Electric Light and Power Users whose electric bills approach \$50 per month. In factories, on farms and under various conditions, WITTE Dieselectric Plants are producing light and power for less than 1c per kilowatt. No peak load or standby charges. Money saved every hour of operation. When not running expense stops! Smooth flowing current—no flicker—close voltage regulation. Generators engineered to the engines they serve.

2 to 10
H. P.



WITTE GASOLINE ENGINES

TYPE "J" ON WOOD SKIDS

Where the amount of power used does not warrant a Diesel Engine our Type "J" on wood skids or Type "K" on iron base is recommended. They are Enclosed, Self Oiling and have Timken Roller Bearings. Operate on gas, gasoline, kerosene or distillate. Lubrication is automatic. Run smooth as an electric motor. Consume less oil and fuel and deliver more power. Pronounced by experts years ahead in design and construction. Buy your power equipment from power specialists. Try a WITTE and profit.

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"Saws 'em down and cuts 'em up." There is money for you to make with a WITTE, timber to be cleared, logs to be cut, wood supplied for fuel. WITTE outfits have safety lever clutch control, saw guide, automatic force feed, human arm swing and other exclusive features. Portable as a wheelbarrow. Engine may be used for belt power the year around. Buy from reputable manufacturers.

FREE CATALOG—CASH or TERMS—QUICK DELIVERY



USED BY THE
U. S. GOVERNMENT

The WITTE cuts logs into fire wood, cord wood, fence posts, cross ties and shingle butt lengths. It is the best sawing outfit ever built. There is no other saw like it.

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Build one of the circuits described in this magazine. **WHOLESALE** can supply parts and tubes for any of them. For everything in radio—go to **WHOLESALE**.

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Described in the Big, Free 1937 Catalog is the complete line of custom-built Lafayette radios, together with many other makes of short wave and all-wave receivers—all at prices which cannot be beaten. Remember — **WHOLESALE** cannot be undersold. **GIVE ELECTRICAL GIFTS THIS XMAS**—they are lasting! Our Special Xmas Catalog contains hundreds of unheard of values. Latest models of **RADIOS, ELECTRICAL TRAINS, TOYS, HOUSEHOLD APPLIANCES,** etc. Send for this catalog **TODAY! IT'S FREE!**

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CATALOG**

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TEST OFFER!**

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of Cameras & Supplies

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Explains latest inventions, methods in Photography and Home Movie Making, for fun and profits. Offers hundreds of amazing, money-saving bargains in still and movie cameras, lenses, films, etc. Used equipment accepted in trade. Satisfaction guaranteed! **WRITE!**

CENTRAL CAMERA CO.
230 S. Wabash, Dept. K-1, Chicago, U. S. A.
PHOTOGRAPHIC HEADQUARTERS SINCE 1899

(Continued from page 120A)

dock was known as a "Camel," the name of the Cronstadt hulk.

The next step was to substitute for a hulk a specially built hull with a large watertight double bottom and watertight double side walls. A cross section of such a dock was like a flat bottomed "U," both the bottom and the side walls being double. Both ends of the dock were open. There were no gates. By flooding the double bottom and side walls the dock could be submerged almost completely. A ship could then be floated into the dock between the arms of the "U," and by pumping out the side walls and double bottom, the dock was made to float with the ship in it.

Self-docking floating docks are of two general types, rigid docks which are bolted, or otherwise fastened together to form a single rigid dock which acts as a unit when raising a vessel, and non-rigid sectional docks in which no attempt is made to connect the sections firmly together. The rigid dock makes little or no demand on the vessel being docked for longitudinal strength and stiffness. In this respect it approaches the graving dock. Its disadvantage is the difficulty of providing connections between the sections capable of taking the heavy stresses to be carried and at the same time having the connections between sections of such a nature that it is practical to separate them for docking and readily reassemble them.

The non-rigid dock consists of a number of short floating docks, each with its own pumping equipment, each separate section or short dock being of such dimensions that it can be docked in two or more of the other sections. The sections are not rigidly connected when used to dock a long ship, each section being so pumped that it lifts and supports its proper proportion of the total weight of the ship.

Docking a ship in a floating dock undoubtedly requires more care than docking in a graving dock. The keel blocking and bilge blocking which are of the same general type as those used in a graving dock are prepared to receive the ship. The dock sections are flooded so the dock sinks low enough in the water to permit the ship to float over the blocking and the ship is then carefully warped into the dock and

centered over the blocking. Power-driven spur shores are used in some large docks, notably the 60,000-ton floating dock at Southampton, to hold the ship centered, and the dock sections are then pumped out to float the dock high enough out of the water to lift the ship and the dock floor clear of it. The pumping must be done carefully with due regard to the weight distribution of the ship if straining of the dock and vessel is to be avoided. Undocking is accomplished by flooding the sections, thus lowering the dock and the ship until the latter is refloated and may be warped out.

For docking relatively small vessels, marine railways remain popular because of the relatively low first cost and low cost of operation. These consist of a sloping runway extending into the water down which a cradle travels on rollers. The cradle is fitted with keel blocks and bilge blocks and may be lowered down the runway into the water or hauled out by means of heavy chains and a power-driven winch or windlass. A vessel is docked by lowering the cradle down the runway into the water, centering the vessel on the blocking and hauling the cradle up the runway with the vessel on it. Marine railways are used at a number of shipyards for docking vessels up to about 2,000 tons displacement, but have not been built for handling larger ships.

To a sailor "docking" means placing a ship in a dry dock, not "berthing" her at a pier. A man-of-war was recently going up the North river to one of the piers near Forty-Second street. She was the flagship of an admiral. The ship was berthed while the admiral was at lunch. An ensign reported to him that "The ship has been docked, sir."

"Go and take another look, my boy," was the reply. "I was at the foot of Forty-Second street two weeks ago and although New York is the city of miracles I don't think they could build a dock in two weeks. Take another look and let me know if the ship has been docked without my orders or berthed in accordance with my orders."

☐ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

A GIFT OF SOLID GOLD

Fully-Equipped, Low-Cost Kit of

GENUINE 23-KARAT GOLD LEAF

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Gold Leaf is lasting. Unlike so-called "gold" paint or bronze powder, it retains its brilliance and won't tarnish because it is made from solid gold. And the gold leaf in this Kit is beaten by Hastings & Co., America's oldest gold-leaf manufacturers.

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(Or order by letter)

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I enclose \$5.00, for which please send me, postpaid, your Home-Workshop Gold Leaf Kit with full instructions and 101 suggested uses. If I am not entirely satisfied, I shall return the Kit within five days and my money will be refunded.

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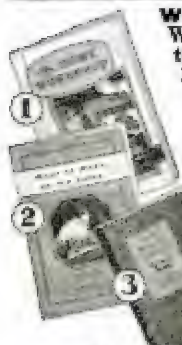
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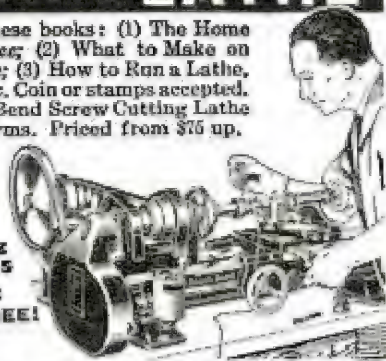
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WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

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Write for FREE Catalog.
THE KALAMAZOO STOVE CO. MFRS.
391 Rochester Avenue
Kalamazoo, Michigan

**"A Kalamazoo
Direct to You"**

The Flying Penman

(Continued from page 69)

Figure it out for yourself. Jim Rose writes his block letters 2,500 to 3,500 feet high, which means they are about a quarter mile or more in width. It takes a gallon of oil to smoke up one letter. Writing two words for one advertiser costs him twenty-five gallons of oil and he burns thirty-five gallons of aviation gasoline in the hour it takes to hang up those two words, and come down to earth. Rose estimates that sixty dollars just about covers the operating expense of an average sky-writing job.

Unfortunately you cannot check up on your handwriting until the job is done. The fellow who looks like a microbe three miles below can see your letters scattering, see your lopsided figures and upslanted lines but you are scooting along at 150 to 175 miles an hour on a level with what you have just written and it is merely a wall of smoke to you.

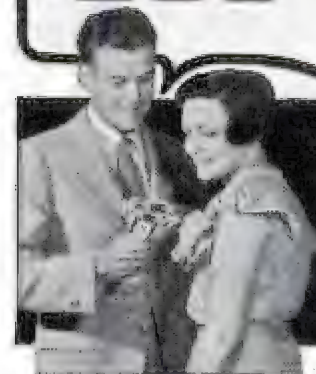
If the wind is blowing from the west, Jim Rose starts spelling from the east; flying into the wind helps hold the word together. He lines up that first letter with some landmark, perhaps a city street, and keeps the rest of the word lined up with the foregoing letters—wind drift takes care of itself.

One thing the flying penman must remember: he has an eraser, but he must never use it. His eraser is the whirling propeller. If he forgets about propeller wash, the first time he swoops around to hang the tail on an "R" he will blow the top of his letter, previously written, into a meaningless cloud. He must never cross his own trail, and so, to dodge it, the sky-writer climbs constantly, each letter fifty feet higher than the last. Hanging up a ten-letter word you'd finish 500 feet higher than you started. Think about that when you start skywriting a three or four-word slogan in air so thin that you and your supercharged engine find breathing a job in itself.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

\$200 My First Week

... Now in
my OWN
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Would you, too, like to own a business where you could take in \$200 your first week as did L. A. Eagles in Madison, Wisconsin?

We want a reputable, honest man in each county. This man need not have any special experience or more than ordinary ability, but he must be honest and courteous.

Such a man we will start in business for himself. You can make far above average profits in the rug-cleaning business—a high-grade business all your own. Many earn \$125 to \$200 per week—some considerably more.

NO SHOP NECESSARY

The rug-washer finishes rugs like new on the customer's floor. Anyone can run it. Electricity does the work. A quick, thorough and highly-efficient method that restores the natural beauty of floor coverings.

There are hundreds of customers—in your vicinity and nearby towns. The business grows steadily. Simply clean a few rugs or carpets. These customers tell others and also give you their future work. Soon you will have a prosperous year-around business. Send coupon for booklet explaining everything.

"Profits Pay for Home"

Harry Hill built and paid for a home from rug-washer profits. His first day's business was \$85. F. E. Bonner writes, "Made \$70 in 13 hours." A. L. Miller says, "Have had rug-washer 6 years—have earned as high as \$92 a day." M. O. Malmin earned 3 times the cost of his machine the first two months. You, too, can enjoy a large income.

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FREE—25¢ Gilbert Thrills Magazine

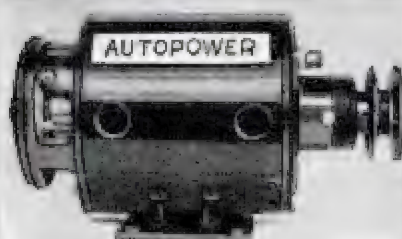
—A gold mine of scientific news. 36 big pages jam full of exciting pictures. Free if you write now.

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27" QUEEN MARY, \$2.50 plus post.

Others \$1.00 to \$6.00. Completely finished hulls and parts of wood; sails, wires, rigging, and all parts included. Also entirely new Beginner's Line, at \$1.00 each. Coach models, too. Rush 3¢ stamp for Illustrated Ship and Coach catalog.

MINIATURE SHIP MODELS, Dept. RT, Parkside, Pa.



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C. J. White says: "\$100 business in six days—never a complaint." That is the nicest part of this business—every customer is more than satisfied. Stains and blotches disappear and vivid colorings and freshness in faded floor coverings come back.

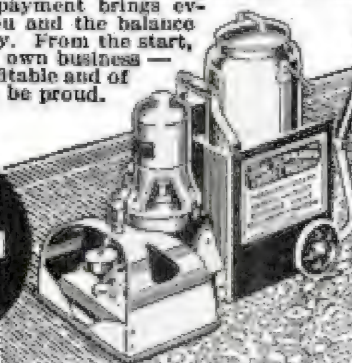
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You take no risk. These machines have been manufactured since 1918 and are used by the United States Government and by Statler and other leading hotels. They are fully GUARANTEED.

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ALL NEW 1937 MODELS!

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A penny post card brings you our new, full-color 16-page BARGAIN CATALOG free. Many models to choose from: 4 to 19 tubes; AC-DC, All-Wave and new Farm sets that operate like city radios!

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Send post card or coupon below for full details of our 30-day no-risk trial and Agent-fee proposition!

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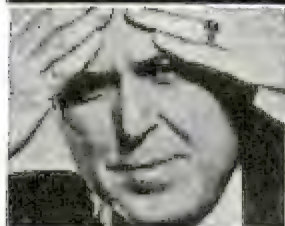
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**TIRED ALL
THE TIME**



**SHE TOLD HIM
WHAT TO DO**

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HE wasn't himself. Had too many restless nights, too many tired days. Seemed to lose his ambition. But his clever wife was too smart to let this go on. She insisted that he try Nature's Remedy (NR Tablets) and he found out what a surprising difference it made to use a laxative of entirely vegetable origin. He didn't mind taking NRs at all, they were so gentle, and non-habit forming. They simply made him feel like a new man. Get a 25c box at any drugstore today.

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Powerful—Accurate—Economical—Practical—Adjustable Shooting Force—Amazing Maximum Velocity—est. 177 or 22 and BB—For 1st and 2nd Prize—The only Genuine Compressed Air Pistol on the market—Single Shot with Bolt Action—Hammer Fire—Hair Trigger—Safety. Price \$7.50. Also 177 and 22 Single Shot Air Rifles \$7.50—Single Shot BB Air Rifle \$5.00—25 Shot BB Repeater Air Rifle \$7.50—at Dealer or Direct—No license required—Safe for indoor use.

FULL DETAILS—TARGETS—FREE—WRITE TODAY.
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\$7.50



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Everything you need! Axle, Tongue, Hitch, Wheel Housings, Wood Parts, Tank, Sink, etc. Send for price list. Includes 25c (coin) for our big Catalog and Trailer Builders' Manual. Satisfaction guaranteed! **TRAILER SUPPLY CO., Box A, Wausau, Wis.**



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Beautifies without matting and enables you to dress hair in any style. Scientifically compounded to combat ravages to the hair of modern outdoor life. **At Druggists, Barbers.**



Trouble Shooter for a Railroad

F 1258 (Continued from page 61)

director has direct contact with all the maintenance forces in the field. The system between Washington and New York is divided into seven zones, each presided over by a power director.

One of the power director's functions is to maintain the power for signal operation. With trains moving in and out of this terminal, light signals must work properly, or serious accidents may result. On both sides of the eight-acre Pennsylvania station are water bodies. Trains approach from east and west through deep tunnels bored beneath the Hudson and East rivers. Often separated by intervals of less than one minute, these trains are controlled by a signal system that keeps them from colliding in the near-total darkness.

When a trolley line is de-energized a telltale light appears on the power director's model board. A red light indicates a switch is closed, a green light that it is open, and a white light indicates power is on. So thorough-going is the communications system in the modern rail terminal that it is never necessary for a power director to appear on the scene of a power break. His telltale lights and his staff of "reporters" furnish him with all the necessary information.

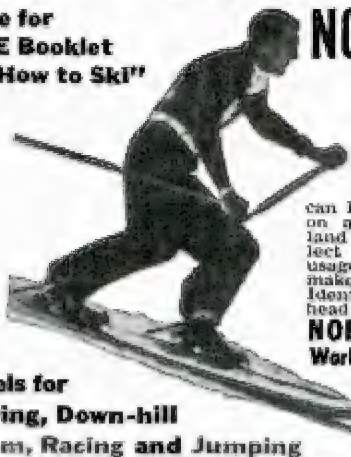
Without remote-control devices, visual signals, and telephones, it would be impossible to run hundreds of trains on accurate schedules. Operators in the various signal stations do not see the trains they direct, nor would they have time to watch if the trains ran before their eyes. It all appears uncanny. Practically nothing is seen to move in the control rooms. Electric currents are the only ties between the central offices and the trains in the field. The four signal stations in Pennsylvania station have 344 levers. They are simply traffic stations in a highly congested area—but no congestion or traffic can be seen.

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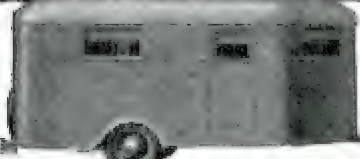
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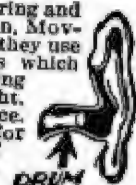
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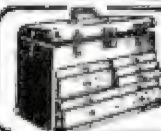
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Casey Jones Turns Motorman

(Continued from page 37)

son from the sun which has just set. The mists and smoke of the city are tinted by the afterglow. The western section of Chicago seems to speed past for there is little noticeable motion in the engine. Then come the suburbs. It is dark now. The long hood of the train looks longer than ever in the darkness. Ahead, the endless ribbons of steel flash and glisten in the glare of the powerful headlight.

A glance at George's face shows he is enjoying it. There is a half smile around his mouth. He looks over and winks. Reaches up and pulls the whistle cord for crossings—two longs, two shorts.

"Just like the one on the 'Queen Mary' only not so big," he boasts, and pulls it again to give another sample of its tone. "You can hear it for five miles."

Out in the open country George opens the throttle wide.

"We're good for eighty-three miles an hour now." Claude Lewis, the engine foreman, explains. "Can't go faster between Chicago and Omaha because of the train control system. Go above that and the red light comes on to make us slow down."

As the throttle bar moves forward the whine of the motors increases in volume. The needle of the speedometer creeps up, slowly at first, then, as the tip passes sixty, more quickly, until it hovers around seventy-nine. When it hits eighty, George shifts the throttle back a notch and takes a "bite" of air—"to offset the momentum."

It was just about then that the fun started. Storm clouds filled the sky to the north and west. They could be seen sweeping in from the horizon, silhouetted in gray-black blotches as fingers of lightning, dozens of them at one time, stabbed swiftly to earth. Then the rain commenced.

"Doesn't look so good," remarks George, taking a quick squint at the sky, then pulling out his watch, estimating the time made thus far and wondering how badly the storm will disrupt his schedule.

He had hardly spoken when, in a sudden burst of sound, the warning whistle went on. At the same instant the green sphere disappeared and the red-and-orange flashed. George grabbed the air bar with both hands. The ominous sound

of the whistle blended with the hiss of rushing air and the rumbling grind of brakes as the twelve-car train slackened speed and slowed finally to a stop.

Passengers behind probably wondered what it was all about during the next hour or so, but only vaguely. The lights were bright back there. The seats were comfortable and, after all, rain is only rain to a passenger. They couldn't know what was going on up forward in that engine cab. Time after time the red-and-orange danger signal would flash. The journey, usually accomplished at a smooth eighty-mile-an-hour pace, became a series of intermittent stops. The rain came down in torrents, accompanied by a high wind which whistled even through the close-sealed windows. In the glare of the powerful searchlight it was impossible to see more than a few feet ahead of the engine's giant nose.

"Worst I've seen in years," said George. He had to yell to make himself heard. Yet when the green signal permitted, he drove ahead—seventy-eight, eighty miles an hour. He knew the road. Traveling along those rails through the night meant nothing more to him than for the average householder to walk through his own home in the dark. George could "feel" his run. Automatically his arm reached up at just the proper time to blast the whistle at crossings.

Benny Neuman, assistant engineer, came into the cab from the engines and slammed the door behind him. He was dripping, soaked to the skin.

"Bad time closing the side ventilators," he yelled. "Closed now, but don't keep out the rain. Might as well try to stop Niagara. Two inches of water on the floor."

The red danger signal came on again. The warning whistle tooted and kept on tooting even after the train had come to a stop.

"Something wrong," Lewis said. He jumped up and disappeared into the engine room again. The whistle, added to the pounding of the rain and the wind gave an eerie spine-tickling sensation as George gave four deep-throated blasts to warn the rear-end brakeman to hop off

(Continued to page 130A)



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with his lantern and red light. A five-minute stop this time, while Diesel expert and electrician searched feverishly for the trouble. The engine room door opened.

"Try the shut-off again."

"Nope. Won't work." George sat calmly in his chair. No responsibility of his.

Lewis examined things for himself, tried tossing the shut-off lever over. The whistle continued its maddening toot. Minutes were precious. Eight or ten are all that can be made up between Chicago and Omaha with the train control system in operation. Then, as suddenly as it blared into sound, the whistle stopped, the green light showed again on the dash. Everyone breathed easier. George grabbed another hasty look at his watch and advanced the throttle, picking up speed. As before, the train whistle moaned at crossings, the rain continued, illumined by revealing displays of lightning.

To ride like this, blind, at eighty miles an hour through a cloudburst; to feel the close contact with danger, the roll and lurch of the train; to hear the rumble of the wheels, the whine of the motors; to wonder what, and how bad it is, ahead; to sit tense, speeding swiftly into the unseen and, to you, unknown, with telephone poles flashing past like so many gray ghosts—that is adventure!

The Mississippi at last. Clinton, Ia., a "division" stop and time for the engine crew to change. The engine crews change eight times between Chicago and Denver. Not until then did George Reid manifest any part of the tension he had been under. He stood up, flexed his arms and legs.

"Well," he said as he disappeared through the side door of the cab and down the ladder, "here we are at last—and me, I'm glad of it."

Do the streamline skippers like their new work? Two or three months ago old-time engineers were still bemoaning the creation of streamliners as "sure death" for the romance of railroading.

"When I have to sink to driving a street car," one old-timer said, "I'll quit."

Well, it is like running a street car, so far as the mechanics of it are concerned. On the Union Pacific division, in fact, they refer to the pilots as "motormen." They have no responsibility for the motors; all they have to do is know how to

(Continued from page 128A)

operate them. A Diesel expert is always on hand to take care of trouble. Yet there must be the "feel" of the old-time engineer; a confidence that comes only with years of experience.

"How do I like 'em?" exclaimed George Reid. "I think they're great. On a night like this, I'd be soaking wet, along with my fireman, from leaning out the cab trying to see ahead. Steam cabs are regular sieves. Tonight—it's been a long time since I saw a worse one—I was dry and comfortable."

On the return run from Denver to Chicago the next night, Engineer C. G. "Dad" Peacock, gave the same sort of answer. "Dad" Peacock is sixty-four years old and has been running an engine for thirty-seven years.

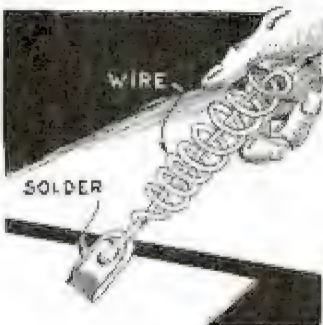
"You couldn't drag me off this run," he said. "I work two hours every other day and get paid by the mile. Why shouldn't I like it? All the time in the world to myself and I'm comfortable even when I'm working."

"Ollie" Mitchell, superintendent of engineers for the Union Pacific, reported there are more applications from old-time engineers for streamliner runs than can be accommodated.

Claude Lewis, engine foreman for the North Western, represents the third generation in his family who have "lived with engines."

"My father was an engineer," he said, "and so was my grandfather. I wish my dad could have lived to ride like this. He wouldn't believe it. Sometimes I almost don't believe it myself."

Handle to Use Short Solder Bars



When working with bar solder, and a piece becomes too short to hold without burning the fingers, one tinsmith solders a coiled wire handle to the short piece so that he can hold it comfortably. He claims that this is better than soldering the short piece to a new bar, as the handle is always cool and does not increase the weight of the solder appreciably.

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Genuine Plastic Wood is also used to repair broken furniture, reset loose bathroom fixtures, loose casters; fill old screw holes, baseboard cracks, shelving cracks, replacing wood rot; fill holes around pipes, wiring, boat and canoe repairs, etc.

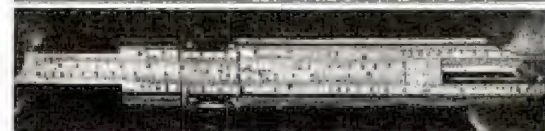
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Hitch Your Wagon to a Car

(Continued from Colorado Section)

comfortable or to utilize the limited space to the utmost. One sleeps four in two compartments and has its own air conditioning system. Outside air enters through a wind scoop, is cleaned in steel wool and and oil air strainer and is cooled in a Dry Ice unit. Several coaches have shower baths, one has a bathtub, and the larger ones have chemical or flush type toilets with septic tanks.

One telescoping model can be extended in width and height when parked and another has a floor which is lowered when parked to increase the headroom. An inexpensive unit consists essentially of two streamlined beds on wheels and a tiny kitchenette, all contained in a compact little unit not much larger than a big trunk. There are a host of collapsible tent trailers and one outfit which really is not a trailer but serves the purpose of one, roosts on top of your car by day and forms an enclosed second-story lean-to at night. Some of the more swanky trailers have tile galleys, others boast Venetian blinds and one make, at least, has a telephone between the tow car and the coach. Some interiors are mahogany, some are leatherette and some are plywood, but one maker went a step further and has his car lined with stucco.

One manufacturer is turning out a line of trailers with pre-shaped body panels like an automobile and with a welded steel frame. Several others have duralumin or other metal for frames and the more expensive ones are likely to have all-metal bodies. Some of the custom-built coaches are actually palaces on wheels. One man has a thirty-five foot trailer weighing 5,900 pounds. It has a real living room, forward observation windows set high enough to command a view of the road ahead, a bedroom, shower bath and galley, and separate quarters for the chauffeur. There is a telephone, windows are of shatterproof glass and equipped with disappearing screens and the luxuries include an electric outlet at every washbasin for operating electric razors or other electric toilet appliances.

Trailer and permanent cottage are combined in one mobile home which is towed

(Continued to page 134A)

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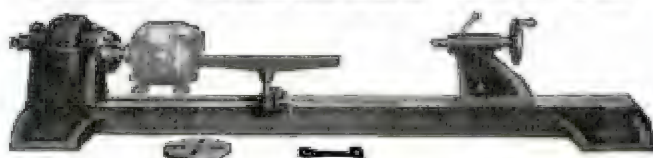
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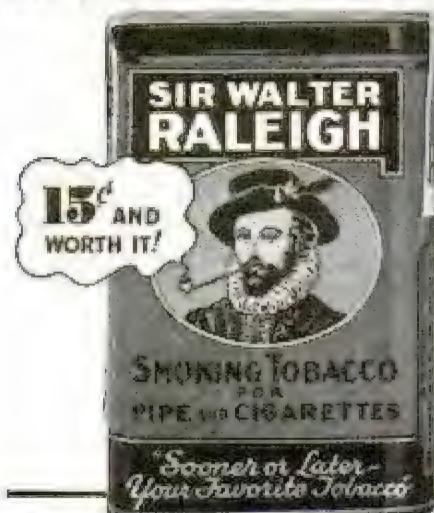
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NBC BLUE NETWORK, MONDAYS 9:30 P. M., E. S. T.

(Continued from page 132A)

behind the car to wherever the owner wishes to live for a while. There he un-hooks it, jacks it up on cement blocks and unfolds it into a four-room bungalow until he decides he doesn't like his neighbors or tires of the scenery. Then he moves on.

So it makes little difference whether you want a trailer to call home the year round or one for vacations, there's a rolling home to fit your purse and there certainly are enough from which to select, so you should have little difficulty picking one with the particular features that appeal most to you. If you can't buy one, you can still live in a trailer. In many places today you can rent a modern trailer by the day, week or month from dealers specializing in this business.

And if, as Mr. Babson predicts, half of us are going to be living on wheels in a few years, you might as well become accustomed to a portable home, even if you have to rent one. The only trouble is that, according to trailer "addicts," once you live in a home on wheels, you're never satisfied to be anchored to a permanent one again.

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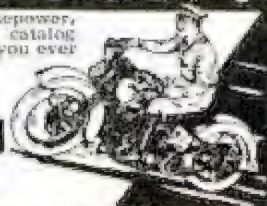
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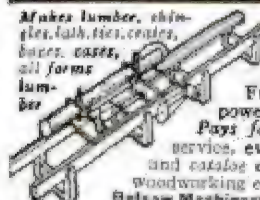
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Six-Tube A.C.-D.C. 2-Band Super

(Continued from page 99)

upon application to Popular Mechanics radio department without charge. The blueprint number is R-233.

All materials, including the base, dynamic speaker and large airplane-type dial should cost about \$15.50, less tubes, from reliable radio parts houses. Cheaper parts might look the same to the inexperienced builder but the results would be quite different. When wiring the set, make all grid,

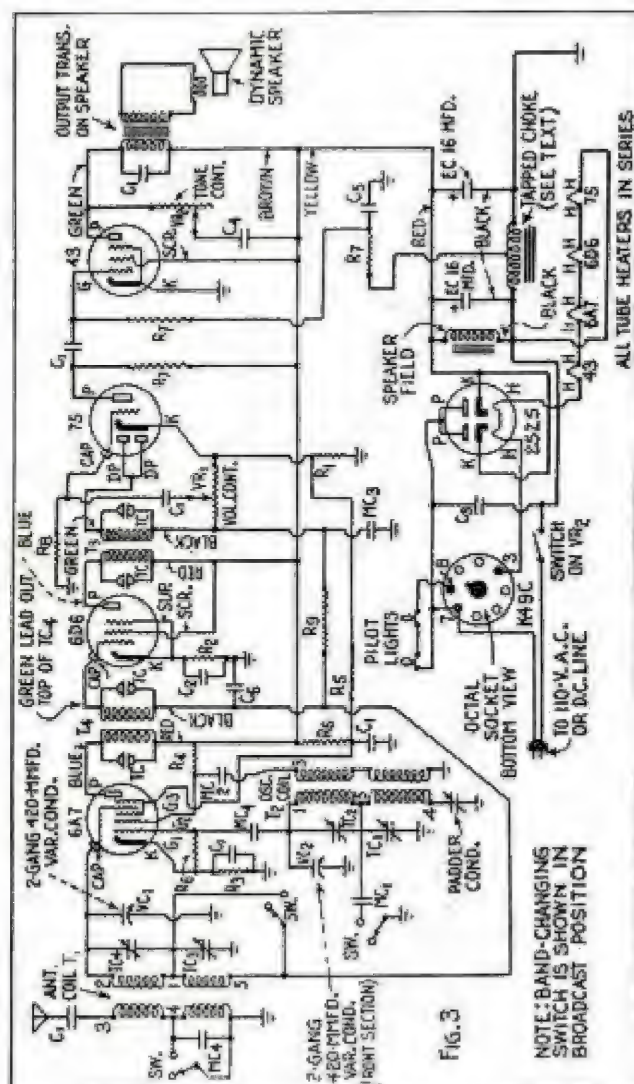


plate and switch leads as short as possible, use rosin-core solder and be sure that every connection is well soldered.

To balance the receiver, connect the antenna, plug in line and turn the wave-changing switch to the right. When the set has warmed up, turn the dial to about 1,400 k.c. and adjust the trimmers (TC) on I.F. transformers T_3 and T_4 to maximum noise. Now tune in a station around 1,400 k.c. whose exact frequency you know; for

(Continued to page 138A)

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18 Watt Amplifier (R230); 150 Watt Transmitter (R231); "A-B" Power Unit for 6 Volt Sets; Beginners' S-W 2 Tuber (R232); and many others. **ALSO**—see pages 125-6-7 of your **ALLIED Catalog** for other new, low-priced Build-Your-Own kits.

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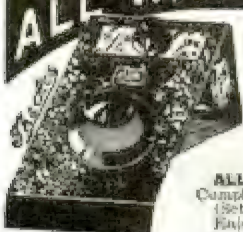
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(Continued from page 136A)

example, WGES, 1,360 k.c. Next adjust the broadcast oscillator trimmer (TC₁) while following the station by retuning the dial until the pointer on the dial indicates the correct frequency. Now adjust trimmer TC₃ for loudest signal, then tune slightly off the station and adjust TC₃ for loudest noise. The next step is to tune the set to about 600 k.c. and adjust the

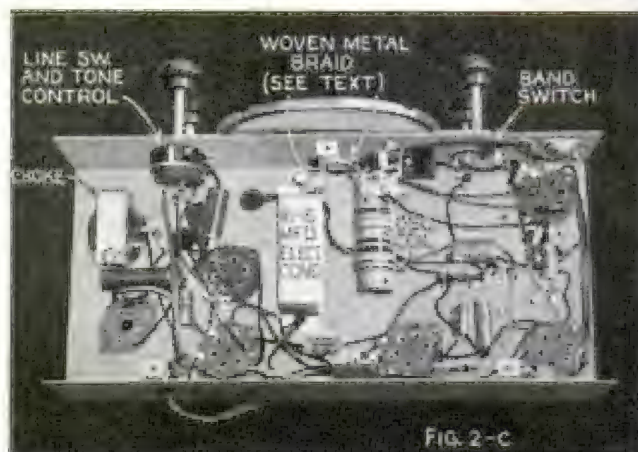
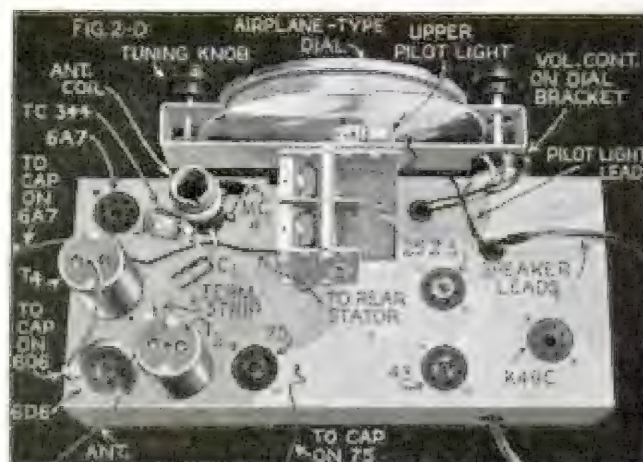


FIG. 2-C

padder condenser for maximum noise. Now go back to 1,400 k.c. and reset TC₁ to correct reading, as this will have shifted when the padder was adjusted.

The best time to balance the short-wave band is in the evening. With band-chang-



ing switch in short-wave position, tune in the amateur phones around 4 megacycles (4,000 k.c.). Adjust oscillator condenser TC₂ until the top of this phone band comes in at exactly 4 megacycles on the lower scale of the dial. The 75-meter phone band extends from 3,900 to 4,000 k.c. Now tune to about 6 megacycles and adjust TC₄ for loudest noise. The padder condenser on the short-wave band is fixed. This is MC₁ which must be exactly 1,900 mmfd., plus or minus not more than three per cent.

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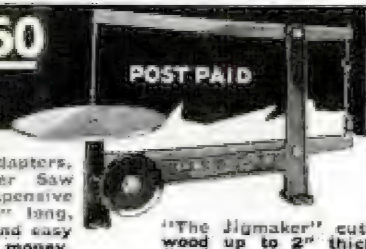
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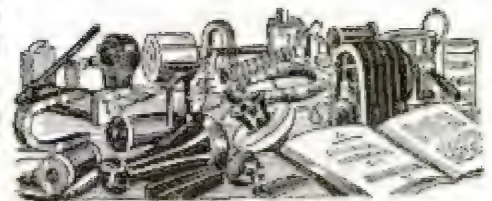
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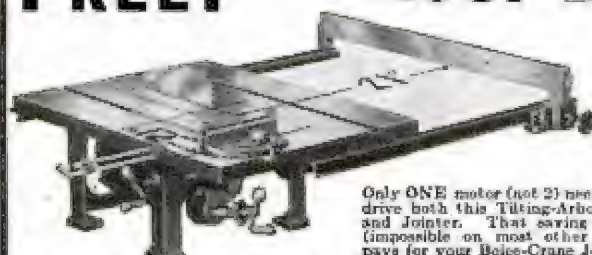
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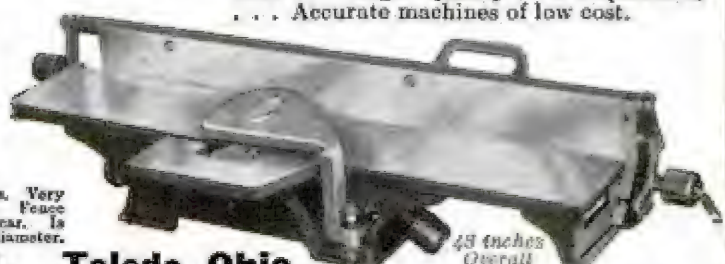
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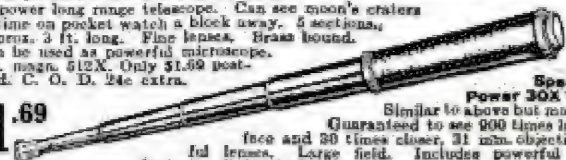
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(Continued from page 140A)

eight," which is skated on one edge and two feet. The "rocker" is another old standby skated on one foot only. The first portion is skated forward and the last half backward but both on the same edge.

The figure "eight" with another circle added can be accomplished by describing a half circle on the right outside forward edge and then carrying this into a full circle by switching to the inner edge of the same skate. When this circle is completed, switch to the left foot, skating for a half circle on its inside edge. Prolong this stroke into a complete circle by switching to the outer edge of the same skate. What has been said for single skaters also may be adapted for pair skating.

The fastest growing feature about figure skating in rinks where there is music, is the waltz. This graceful dance carries the bulk of its charm and grace to the ice, as it is performed in virtually the same manner as in a ballroom. After taking their positions as partners, the pair strike off on opposite feet. Then the man turns an outer forward "three" while the woman makes the same turn on the outer backward edge. Completing three turns apiece, they change direction so as to dance in a large imaginary figure "eight."

A livelier form of the waltz is the "ten step." It is composed of ten steps divided into four beats. The first beat includes steps one, two and three; four, five and six comprise the second beat, and seven, eight, nine and ten are the third and fourth beats. The partners take the usual position, and if the man's first three steps are left outside forward, right inside forward and left outside forward, the woman's will be right outside backward, left inside backward, and right outside backward. The change from three to four is made almost with a half turn and steps four and five complete it so the man is skating backward and his partner forward. On steps nine and ten the partners make their final turn, and then start all over.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

Easier Motoring for 1937

(Continued from page 5)

Starting at Pontiac and running through two models in the Cadillac line, General Motors features all steel body and top, longer wheelbase, larger power plant, and either the hypoid rear axle or propeller shaft specially designed to permit lowering the car floor. Pontiac "8" has a wheelbase of 122 inches, open-type independent wheel suspension and an inverted fuel pump located in the windstream below the engine pan to reduce vapor lock.

Oldsmobile is represented by a six-cylinder and an eight-cylinder car, each of which is individual in appearance. The 110-horsepower eight-cylinder engine is set into a larger chassis, 124-inch wheelbase, and its power is transmitted to the rear wheels by a two-piece propeller shaft with three universal joints. The fuel pump is located as in the Pontiac. Greater economy is claimed. Oldsmobile has located the body about six inches ahead, in relation to the rear axle, to improve the ride. A club coupe in which there are two folding seats behind the driver's seat is included in the group.

Buick follows the general pattern, with its small car powered by 100-horsepower engine set into a chassis with 122-inch wheelbase, and its second car, the Century, boasting 130-horsepower engine and 126-inch wheelbase. The hypoid rear axle is used on both models. An aviation-type carburetor assures full power operation under all driving conditions. LaSalle switches from eight-in-line to V-eight engine, rated at 125 horsepower, and employs a wheelbase four inches longer than the 1936 models. Cadillac "60," the smallest car in that line, is four inches longer and its engine is stepped up to 135 horsepower. It also uses the hypoid rear axle to permit lowering the over-all height, and to give more headroom. Cadillac adds a new car, the "65," which is set on a wheelbase of 131 inches and is priced just above the "60."

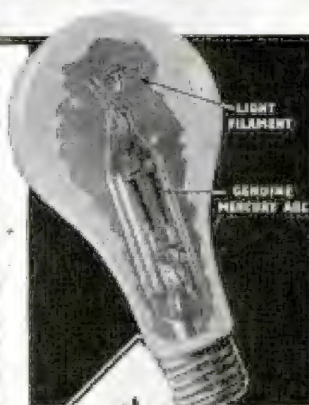
Lincoln-Zephyr is virtually unchanged in appearance, but it has an improved steering system, spare tire so mounted in the baggage compartment that it may be swung out of the way for loading or unloading, and an enclosed grille extending

(Continued to page 156A)

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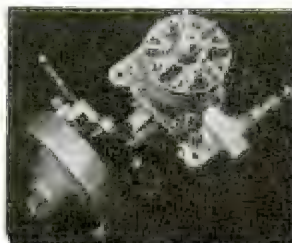
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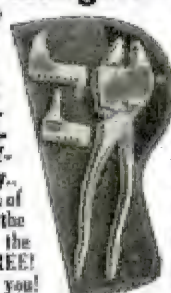
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The Home that Runs Itself

(Continued from page 54)

There's no stale smoke smell left here. And here's a card table. It's electric too. You plug in on the under side for a light, a cigarette lighter or the coffee maker after the game's over."

The dining-room table likewise is electrified. Reels attached to the under side carry cords which are pulled out and plugged into the coffee maker, the egg cooker, the waffle iron, the toaster or any of half a dozen other appliances for table cooking. Pull out the plugs and the cords are whisked out of sight by the reels. There's a timer at one end of the table to turn off the current when the coffee is cooked. A meter under the table measures the current used for cooking. The main line plugs into the floor under the table so all wires are concealed. From the opened doors of a built-in china closet flows a cooling breeze. It emanates from a vent above the top shelf.

"Comes from the air conditioner in the basement," explains Mr. Ripley. "On summer nights I close the doors of the china cabinet and the cool air goes up to my bedroom right above."

The dining-room light fixture has just one bulb, but it's a 100, a 200 and a 300-watt bulb all in one. One turn of the switch and you have 100 watts, three turns and you have 300, four turns and it's out. There's an electric clock in the living room, there's another in this dining room.

"You'll find 'em in every room in the house," explains Mr. Ripley. "We have a vacuum cleaner for each floor and fifteen all-night lights of five or seven watts each scattered about the house and garage. They discourage burglars."

Virtually everything in the kitchen runs by electricity and most of it is automatic. The electric range is equipped with a thermostat and a timer, the dishwasher operates with a simple control and the metal sink contains the garbage preventer. All waste from potato peelings to soup bones goes down the drain. A grinder operated by a quarter-horsepower motor converts the waste to a pulp which is flushed away through the sewer system.

An exhaust fan in a window carries away cooking odors. There's an elaborate mixer which also kneads bread dough. A

grinder grinds the wheat, the mixer kneads the dough, and the oven bakes the bread, each at the turn of a switch. There's a kitchen radio, the inevitable clock, an electric floor waxer and a cabinet full of smaller kitchen utensils, including a double boiler; all run by electricity.

The upstairs is just as electrified. Over the bath tub is the sun lamp. There are two others beside the mirror.

"If you don't like baths, you get your sunshine while shaving," explains Mr. Ripley.

In his bedroom is an exerciser mounted on a small table. There's a timer to turn it off when you have absorbed enough punishment. Mr. Ripley goes through his morning exercises on this machine, goes downstairs and starts his breakfast on the electrified dining-room table, goes upstairs and shaves, then comes back downstairs to find a hot breakfast waiting for him in the coffee maker, the egg cooker and the toaster.

The outside of this home is almost as electrified as the inside. There's a bug killer on a side porch and a marine lamp which casts a rosy glow over the side of the house when there's a party, and a sodium vapor lamp in the garden which gives a grotesque hue to the shrubbery. And Mr. Ripley, with the aid of electricity, has stripped the last vestige of privacy from 200 giant goldfish in a 3,000-gallon pool. Artificial lily pads form shades for underwater lights. Other colored lights and waterproof cords are sunk in the pool or shine down on it from above. At night, with the aid of the lights, you see every fish on parade. Above the pool is another bug killer. The fish gather in droves beneath it to watch for the spark which signals their next titbit is on the way down.

"These fish," says Mr. Ripley, "thrive on light. Some of them are more than a foot long. We feed 'em hamburger sandwiches—raw hamburger and crumbled bread."

There are more than 100 outlets in the house and more than a dozen outside. The Ripleys use them all. In the basement, besides the oil furnace, which fits under the stairs, the washer, ironer and dryer in the laundry, and the air conditioner, there's an electrified home workshop. One side of the basement is a recreation room. There's

(Continued to page 146A)

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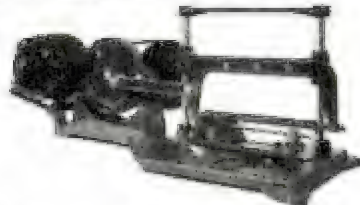
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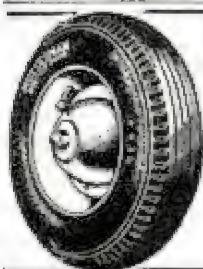
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(Continued from page 145A)

a shooting gallery with floodlights and frosted-tube lights to illuminate the target and there's a little theater where Mr. Ripley and young Charles, Jr., entertain their friends with their own private house of magic. The stage is equipped with neon, black ultraviolet, mercury vapor and sodium lights, all operated from a control box. With the aid of these lights and some fluorescent materials and color drawings, it requires only a few minutes to prove to anyone that you can't believe what you see as far as colors are concerned. And the stage has a piano—electric, of course.

Everywhere inside and outside this home you find electric appliances—a battery charger in the garage, an electric moth killer, a garage light which turns itself out, an electric hand dryer, a baby milk bottle warmer, curling irons, an electric speedboat to aerate the fish pool—you find Handy Annie's tools at every turn.

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(Concluded next month)

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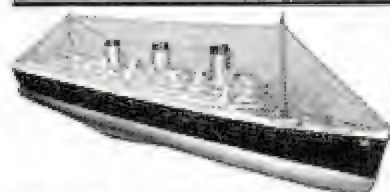
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Breaking Speed Records

(Continued from page 29)

overhead cam, twenty-four exhaust and intake valves. The block is aluminum with steel cylinder casings and aluminum pistons. The oil reservoir holds twenty-eight quarts and the gas tank ninety-five gallons. The "Meteor" was built with the aid of nine trained mechanics in two months. The dash carries the standard equipment plus a tachometer and dials to indicate the temperature of the transmission and differential.

All speed tests made on the Salt Flats are under the observation of the Automobile Association of America. A timer's shack on the speed course houses the instruments and two banks of stop watches which alternately time the lap of a car. An electric eye with a beam across the course governs the watches.

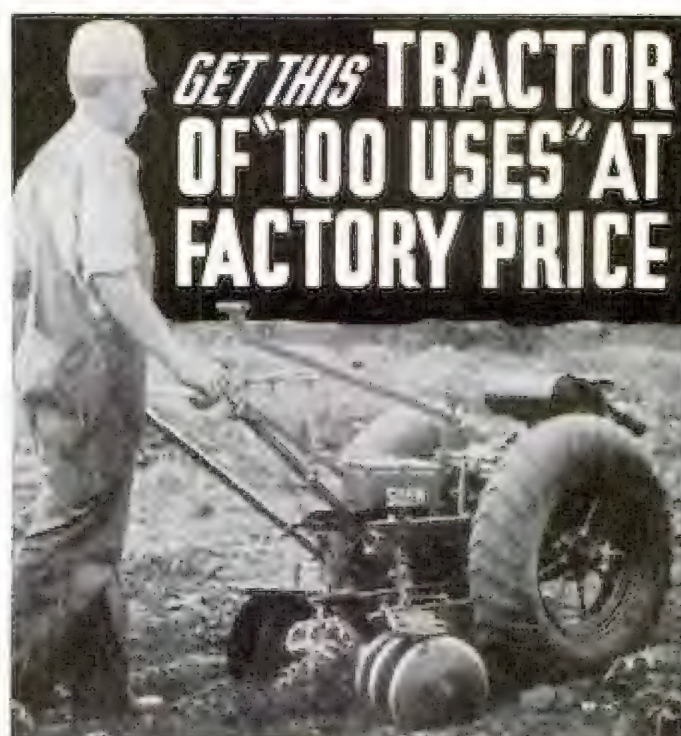
John Cobb, British driver, with his special Napier-Railton 600-horsepower, twelve-cylinder racer also established a host of new records on the flats, including the twenty-four-hour record of 150.16 miles per hour, but lost most of them a few days later to Jenkins. Streamlining was ignored in the construction of Cobb's car. The car, worth \$25,000, has old-fashioned high wheels and required two years to build. It weighs 5,000 pounds and has never been stopped by mechanical failure. The motor has three rows of four cylinders, in other words it is a V-motor with a row of four cylinders in between the V. It has two spark plugs to each cylinder, and an up-draft carburetor. It has a special three-speed transmission, cantilever springs and its starter is an electric motor, whose shaft, equipped with a roller, engages the rear wheel by friction, thus propelling the car to a start.

Captain George Eyston in July, 1936, established over sixty records to be lost later to Cobb and Jenkins. Eyston drove his "Speed of the Winds," a shark-nosed twelve-cylinder Rolls Royce to a new record of 149.16 for twenty-four hours and 135.35 miles per hour for forty-eight hours. The "Speed of the Winds" has a twelve-cylinder motor, dual ignition and a special selective transmission mounted ahead of the motor as the car is a front-wheel drive. The car, beautifully streamlined, is made largely of airplane tubing

and duralumin welded and bolted together. In April, 1936, Eyston established two records for a Diesel powered vehicle. He drove his "Flying Spray" over the Salt Flats at a speed of 158.87 miles per hour for the measured mile and 159 miles per hour for the kilometer. The old Diesel record was 137 miles per hour. The "Flying Spray" was powered with the same motor used in the big Diesel passenger buses in London.

The most spectacular event ever recorded on the flats occurred in September, 1935, when Sir Malcolm Campbell drove his six-ton "Bluebird" on a thirteen-mile straightaway to a new world's record of 301 miles per hour. That was a great day for those in the reviewing stand opposite the measured mile. Faintly they heard the oncoming juggernaut throbbing and pulsating as it roared over the horizon, a cloud of salt in its wake. Like the hum of a monster bumble bee, the noise increased. Then a higher key, a new pitch was heard as the car neared the measured mile. The howl of the motor reached an agonizing tempo that smote the ears with painful penetration as the "Bluebird" flashed past the reviewing stand in a blur of white salt dust. Then the rhythmic pulse of the "Bluebird's" power plant faded into a bumble-bee hum and the comet of steel became a black dot and disappeared over the horizon. The measured mile had been passed.

The driver had six miles in which to stop his car and make the return trip within an hour. The six-ton juggernaut was losing speed when, with an explosion, the left front tire blew out. The "Bluebird" swerved from its course and then back again. The iron-nerved Britisher held the car to the track marked with an eighteen-inch black line and had reduced speed to 175 miles per hour when the tire burst into flames. The car continued on to the end of the course, the tire a flaming pin wheel. Mechanics extinguished the flames, changed tires and turned the blue monster for the return trip. The car made the first lap at 304 miles per hour. The return trip was made at 298 miles per hour, an average of 301 miles per hour, a world's record. The "Bluebird's" engine was a supercharged twelve-cylinder Rolls Royce which at 3,200 revolutions per minute developed 300 miles per hour.



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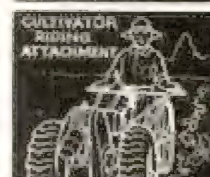
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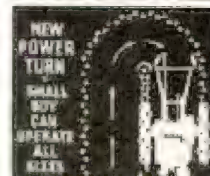
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Gold Farmers of the West

F1208 (Continued from page 116A)

recovered. In some places there are deposits of rich ore but the ore is of such a complex nature that the cost of taking out the gold is prohibitive. In these cases, also, man must wait until nature grinds it down and frees the gold.

In some parts of the gold country small quantities of gold are scattered all through the ground. Hills and fields containing millions of dollars worth of metal are planted to orchards and farm crops because it costs too much to get the gold out. In an effort to get this gold at a profit, mining men are resorting again to hydraulic mining. Powerful streams of water are turned against the side of a hill, the force of the water tearing away the dirt and boulders. Then the dirt and water travel through sluice boxes where the gold is trapped. Hydraulic mining was a fast, cheap way of making a big fortune in the last century but the method was prohibited when it was found that the debris settled in the valleys and ruined thousands of acres of fertile ground. Now, under certain restrictions that include the building of retention dams for holding the debris, hydraulic mining is starting up again. Hydraulic mining costs about fourteen cents per cubic yard today and all the gold above that represents profit.

Another way low-grade gold deposits are worked is with gold boats, huge dredges equipped with endless chains of buckets that scoop up gravel at the rate of hundreds of yards per day. Each of the big boats moves in its own man-made lake, traveling up the course of some old stream and eating its way along the channel. The boom that carries the buckets can be lowered forty or fifty feet down to bedrock. From the buckets the gravel and sand are carried through sluice boxes and over recovery tables inside the barge. The material from which the gold has been extracted travels over another endless belt and is piled up behind the dredger.

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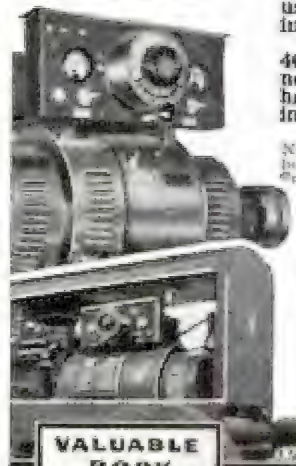
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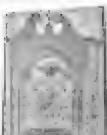
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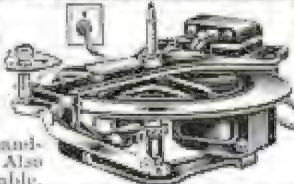
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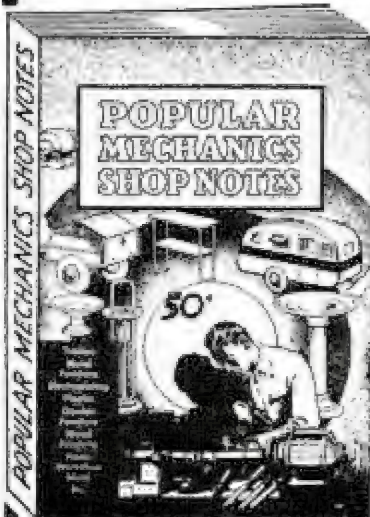
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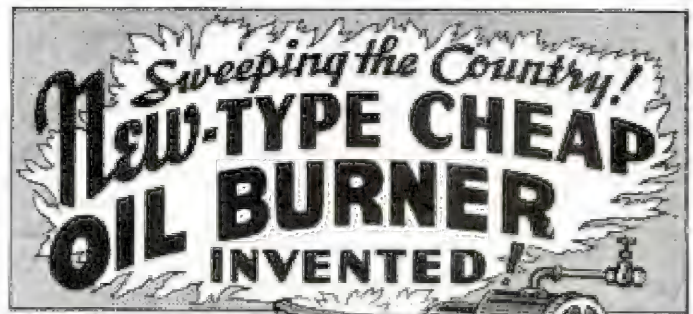
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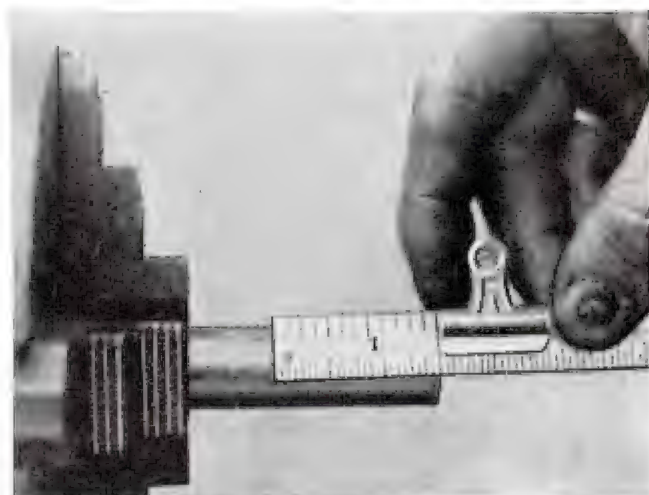
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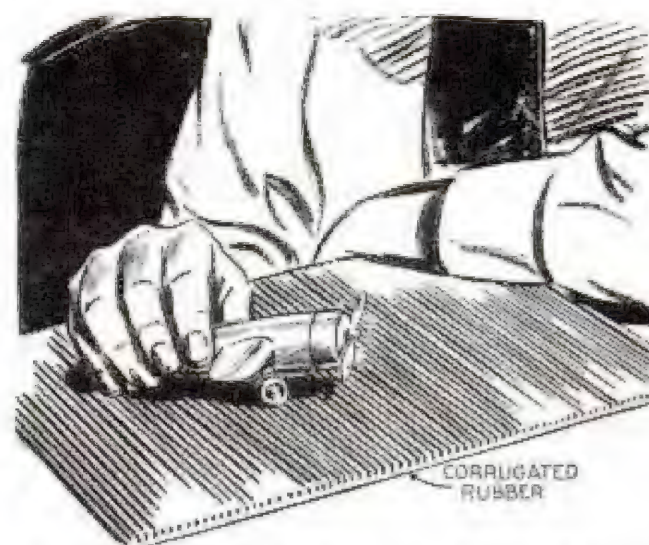


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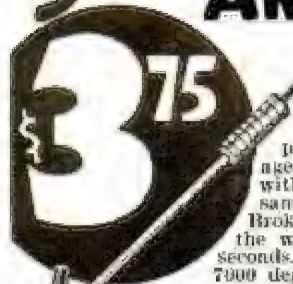
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Vibration set up in the plane when it is pushed over corrugated rubber causes the propeller to whirl

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Easier Motoring for 1937

(Continued from page 143A)

from the instrument panel to the top of the transmission housing. This grille is designed to house radio and heater. The Cord also has few changes. It is available with 125-horsepower or supercharged 170-horsepower engine. Nash joins the parade of all-steel bodies and tops, and features the folding bed introduced last year in the Lafayette. A special speedometer to be used in connection with the optional cruis-



Top, grille extending from instrument panel to transmission housing in Lincoln-Zephyr. It houses radio and heater. Bottom, new exhaust pipe of Cadillac and LaSalle permits smooth flow of gases and reduces exhaust noise

ing gear shows car speed and also engine speed in miles per hour. Louver openings in the hood have been eliminated by Nash engineers.

Service-station attendants will welcome the new location of the battery under the hood, at the left-hand side, in Hudson, Terraplane and Willys. In Chevrolet, oil filler, radiator filler and gasoline filler pipes are all located on the right-hand side so that the car may be serviced without the attendant stepping off the curb into the path of traffic.

Ford, Chrysler and Studebaker join Lincoln-Zephyr in use of the hood top pivoted at the rear. Unlocked by manipu-

(Continued to page 158A)

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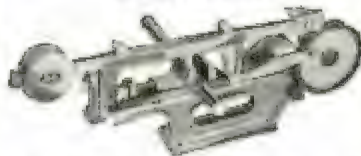
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Easier Motoring for 1937

(Continued from page 156A)

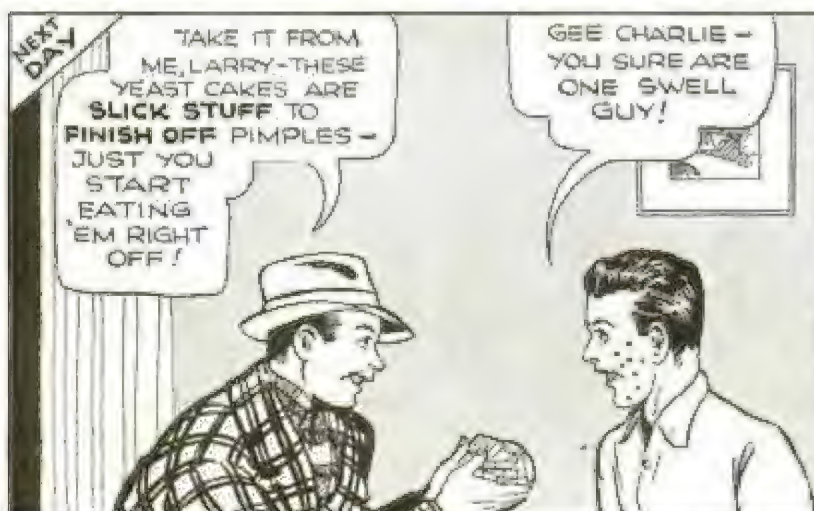
lating the ornament, the front of the hood lifts for servicing.

An automatic hill-holding device, which prevents the car from rolling backward on inclines, is optional on Terraplane and Hudson. Operated hydraulically from the braking system, the device is released by stepping on the clutch.

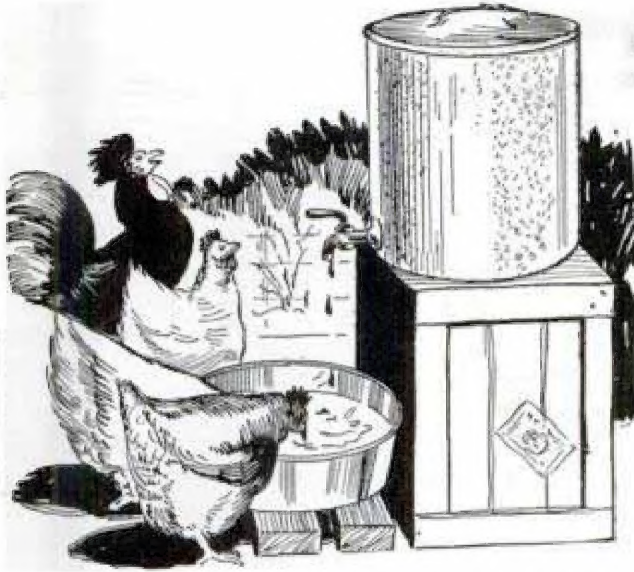
On the oil pressure gauge in Hudson and Terraplane is an opaque panel in which flashes the word "No" when pressure drops. The word "Not" flashes on the ammeter panel when the generator is not charging. Thus the two devices quickly warn the driver of conditions which might cause trouble.

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ingly, he constructed the water fountains in the pens so that the water would drip from a faucet of the tank into a pan be-



Chickens encouraged to drink plenty of water consume more mash, which increases egg production

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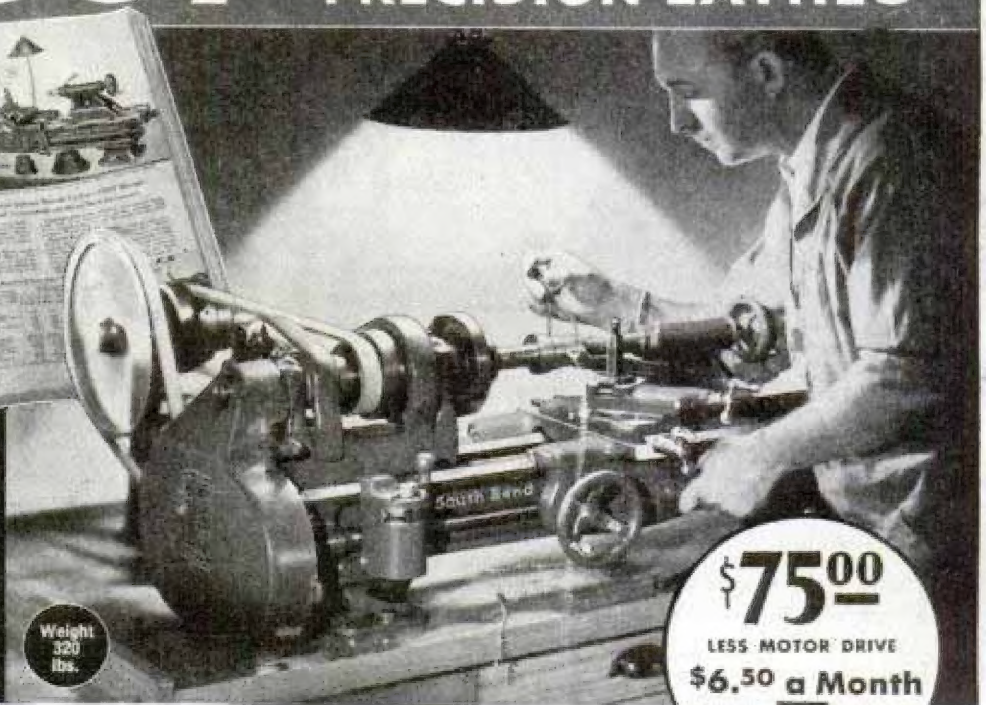
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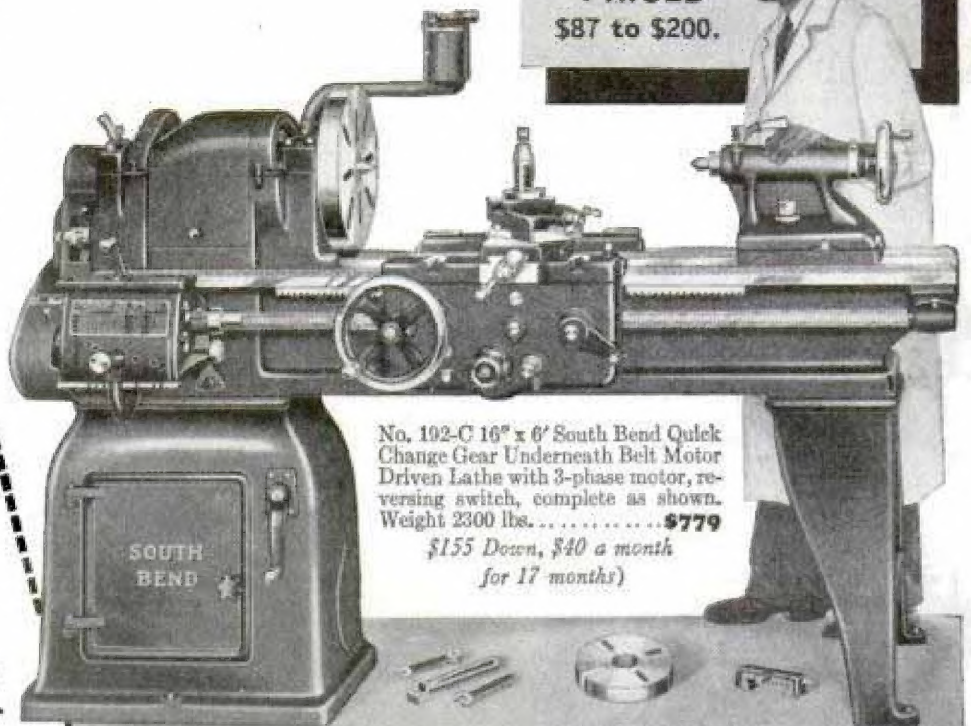
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No. 192-C 16" x 6" South Bend Quick Change Gear Underneath Belt Motor Driven Lathe with 3-phase motor, reversing switch, complete as shown. Weight 2300 lbs. **\$779**

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